CR-91 Event – Shelby County, AL
Preliminary Air Monitoring Summary
September 17, 2016 05:00

Prepared by
Center for Toxicology and Environmental Health, L.L.C. (CTEH®)
On Behalf of Colonial Pipeline

CTEH CENTER FOR TOXICOLOGY AND ENVIRONMENTAL HEALTH, LLC

Introduction

On September 9, 2016, the Center for Toxicology and Environmental Health, L.L.C. (CTEH®) initiated air monitoring in support of response efforts to the gasoline release in Shelby County, AL. This report presents the real-time air monitoring data recorded from September 16 2016 17:00 to September 17, 2016 05:00 CDT.

Real-Time Air Monitoring[1]

Real-time air monitoring was conducted to evaluate the potential airborne presence of gasoline-associated constituents, if any, during response operations. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as total volatile organic compounds (VOCs), oxygen, benzene, and flammability as the percent of the lower explosive limit (LEL) using remote telemetering RAESystems® AreaRAEs, hand-held instruments such as RAESystems® MultiRAE Pro/Plus' and UltraRAEs, as well as Gastec® colorimetric detection tubes.

During this monitoring period, four benzene and six VOC action level exceedances were recorded during worker activity monitoring, including instantaneous VOC and benzene readings which were recorded above the action level. When necessary, workers egressed the area in accordance with the approved sampling and analysis plan.

Table 1, below, presents the results of real-time air monitoring using hand-held instruments. Maps of the incident site location and locations of hand-held real-time air monitoring readings are provided in **Appendix I**.

[1] *Real-time air monitoring refers to the use of hand-held instruments that provide near-instantaneous readings of an airborne chemical concentration without the need for laboratory analysis.*

Table 1: Hand-Held Real-Time Air Monitoring Summary[1]

September 16, 2016 17:00 to September 17, 2016 05:00

Location Category	Analyte	Instrument	Count of Readings	Count of Detections	Range of Detections[2,3]
Worker Activity Monitoring	Benzene	UltraRAE	35	5	0.5 - 1.9 ppm
	%LEL	MultiRAE Plus	58	0	<1 %
		MultiRAE Pro	46	0	<1 %
	O_2	MultiRAE Plus	3	2	20.9 - 20.9 %
		MultiRAE Pro	2	2	20.9 - 20.9 %
	VOCs	MultiRAE Plus	57	2	1.7 - 1.7 ppm
		MultiRAE Pro	57	16	0.2 - 159 ppm
Site Characterization	Benzene	UltraRAE	4	1	11.05 - 11.05 ppm
	LEL	MultiRAE Pro	8	5	4 - 25 %
	VOC	MultiRAE Pro	8	8	1 - 512 ppm

[1]Please Note: The data displayed in the above table has not undergone complete QC analysis and is presented in a preliminary format.
[2]Maximum detections preceded by the "<" symbol are considered non-detections below the instrument limit of detection (LoD) value to the right.
[3]Numbers are the raw values, no correction factors have been applied.

During this monitoring period remote telemetering equipment recorded 5445 detections of VOCs above the CTEH established action level of 30 ppm and 45 detections of LEL above the CTEH established action level of 10% (3% as raw values on LEL sensors).

Table 2 (below) summarizes remote telemetering AreaRAE data for this monitoring period. For this reporting period AreaRAE monitoring data may contain drift events[2]. **Appendix I** and **Appendix II** include location maps and graphs for remote telemetering data, respectively. [4]

[2] *Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.*

Table 2: Remote Telemetering Real-time Air Monitoring Summary[1,3]

September 16, 2016 17:00 to September 16, 2016 05:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections[2]
AR01	2A Compressors	LEL	2624	62	1.1 - 8.9 %
		O_2	2624	2624	20.9 - 21.3 %
		VOC	2624	2427	0.1 - 1408.5 ppm
AR03	West of Release Site/Near Stopple 1	LEL	26	0	<1 %
		O_2	26	26	20.9 - 21.5 %
		VOC	26	16	0.2 - 38.5 ppm
AR04	2A Frac Tank Staging	LEL	2453	0	<1 %
		O_2	2453	2453	20.9 - 20.9 %
		VOC	2453	1904	0.1 - 63.7 ppm
AR05	2A Recovery	LEL	630	0	<1 %
		O_2	630	630	20.9 - 21.5 %
		VOC	630	386	0.1 - 117.5 ppm
AR06	East of Release Site/Near Stopple 2	LEL	1993	164	1.2 - 4.2 %
		O_2	1993	1993	20.9 - 22.2 %
		VOC	1993	1642	0.1 - 100.4 ppm
AR07	2B Recovery	LEL	2583	0	<1 %
		O_2	2583	2583	20.9 - 21.1 %
		VOC	2583	1012	0.1 - 142.6 ppm
AR08	Main Staging Area Frac Tanks	LEL	2651	44	1.2 - 22.3 %
		O_2	2651	2651	20.9 - 21.3 %
		VOC	2651	288	0.1 - 947.5 ppm
AR09	Release Site	LEL	1499	2	1.5 - 3.9 %
		O_2	1499	1499	20.5 - 20.9 %
		VOC	1499	1292	0.1 - 131.6 ppm
AR10	On path between Recovery 2A and Recovery 2B.	LEL	2603	0	<1 %
		O_2	2603	2603	20.9 - 20.9 %
		VOC	2603	2572	0.1 - 343.2 ppm
AR11	Main Staging Entrance East of TRG checkpoint	LEL	1976	0	<1 %
		O_2	1976	1976	20.9 - 21.2 %
		VOC	1976	0	<0.1 ppm
AR13	TRG Checkpoint 2 - access to stopple 1, Recovery 2A and 2A Frac Tank Staging Area.	LEL	1214	0	<1 %
		O_2	1214	1214	20.9 - 21.5 %
		VOC	1214	1	1.3 - 1.3 ppm
AR14	Cab of excavator at release site	LEL	1443	0	<1 %
		O_2	1443	1443	20.5 - 20.9 %
		VOC	1443	1443	1.7 - 149.4 ppm

[1]*Please note: The data displayed here has not undergone complete QA/QC analysis and is presented in a preliminary format.*

[2]*Maximum detections preceded by the "<" symbol are considered at the limit of detection (LoD) value to the right.*

[3]*LEL and VOC values are raw values, correction factors have not been applied.*

Appendix I:

Site Location, Hand-Held Real-Time Air Monitoring Location, and Remote Telemetering Air Monitoring Location Maps

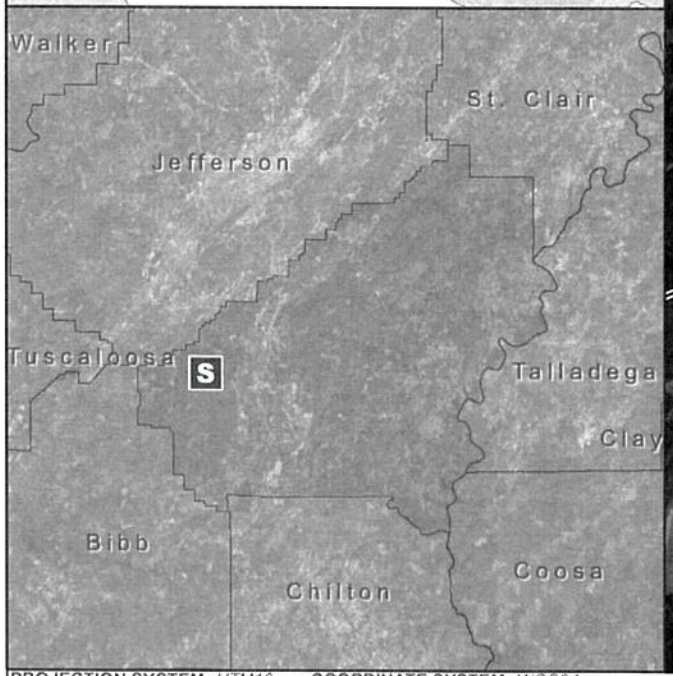
CTEH

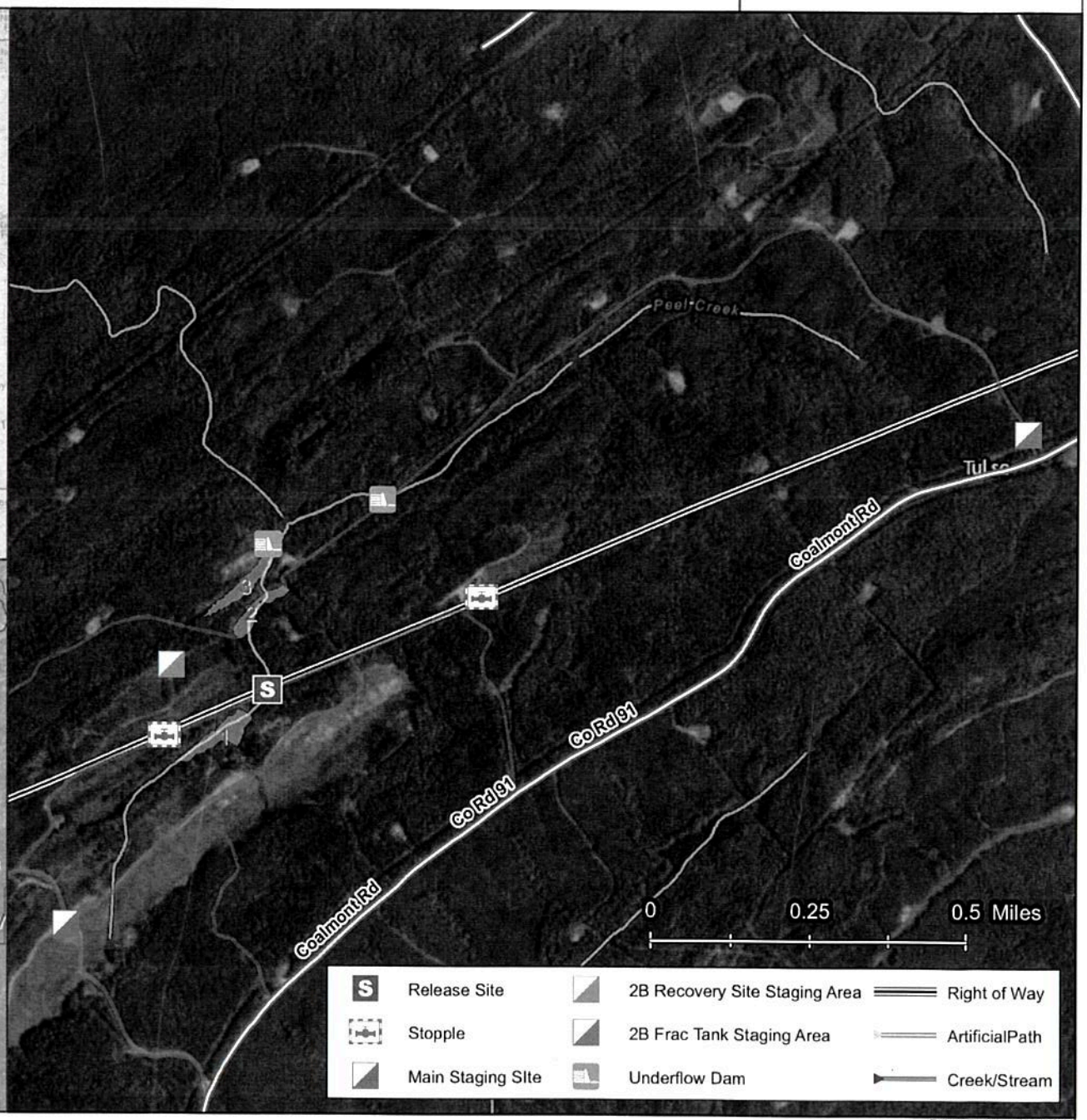
CR-91 Event

Site Location

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL





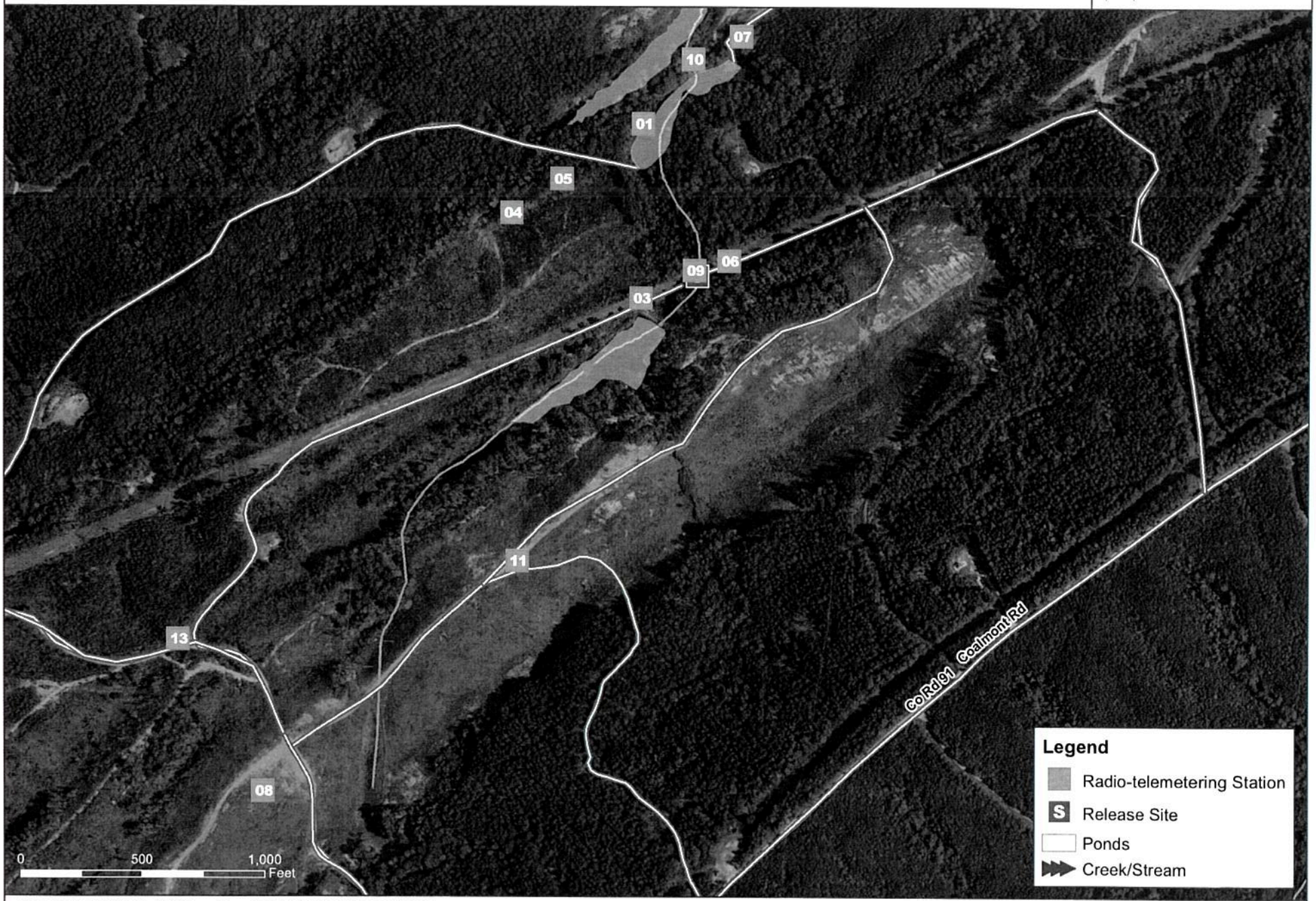
PROJECTION SYSTEM: *UTM16* COORDINATE SYSTEM: *WGS84*

Print Date: *9/15/2016*

Radio-telemetering Real-time Air Monitoring Station Locations

CR-91 Event 9/17/2016

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, LA



PROJECTION SYSTEM: *UTM Zone 16* COORDINATE SYSTEM: *WGS84*

Print Date: *9/17/2016*

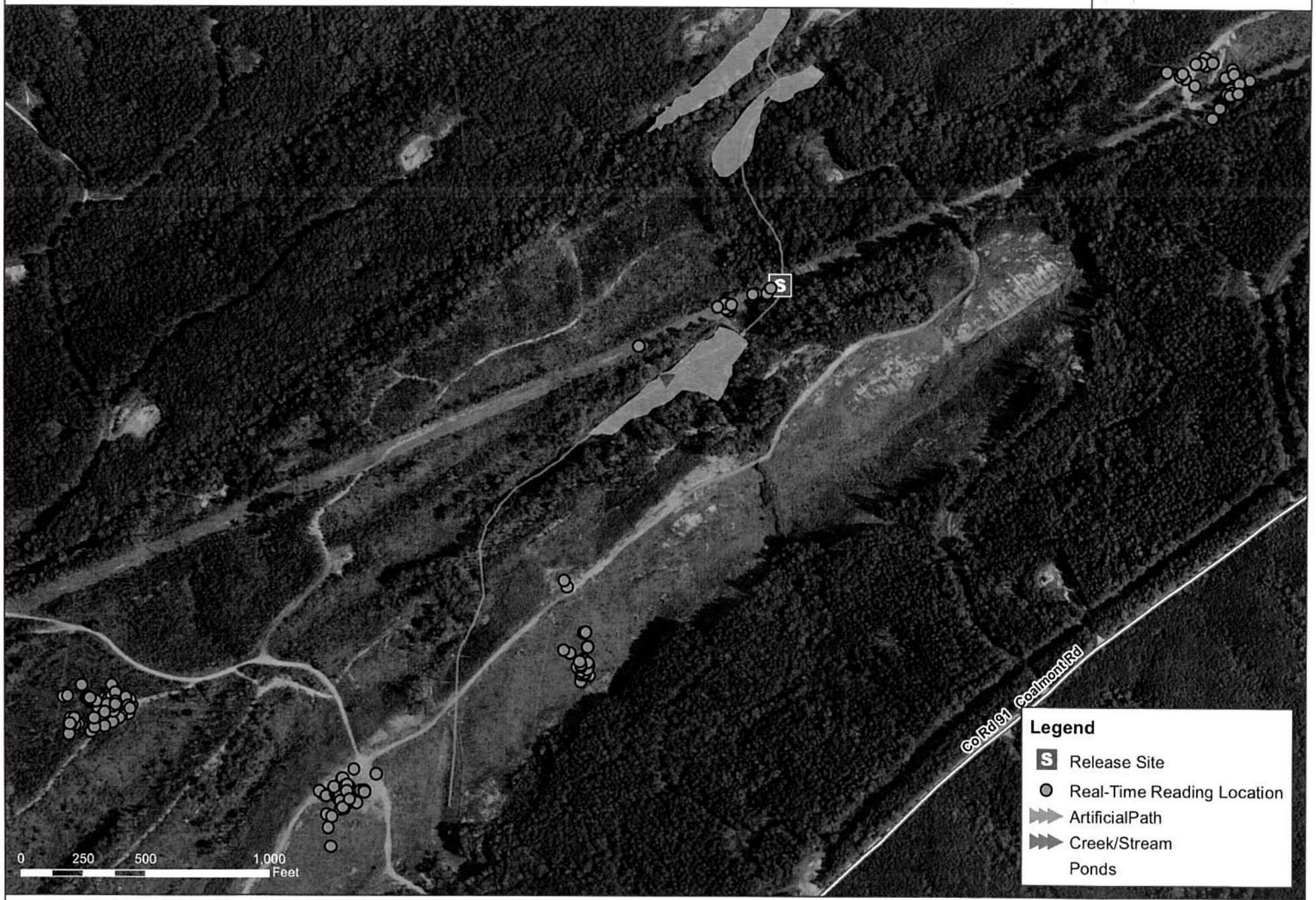
CTEH

Manually-Logged Real-Time Reading Locations

CR-91 Event | 09/16/2016 17:00 – 09/17/2016 05:00

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

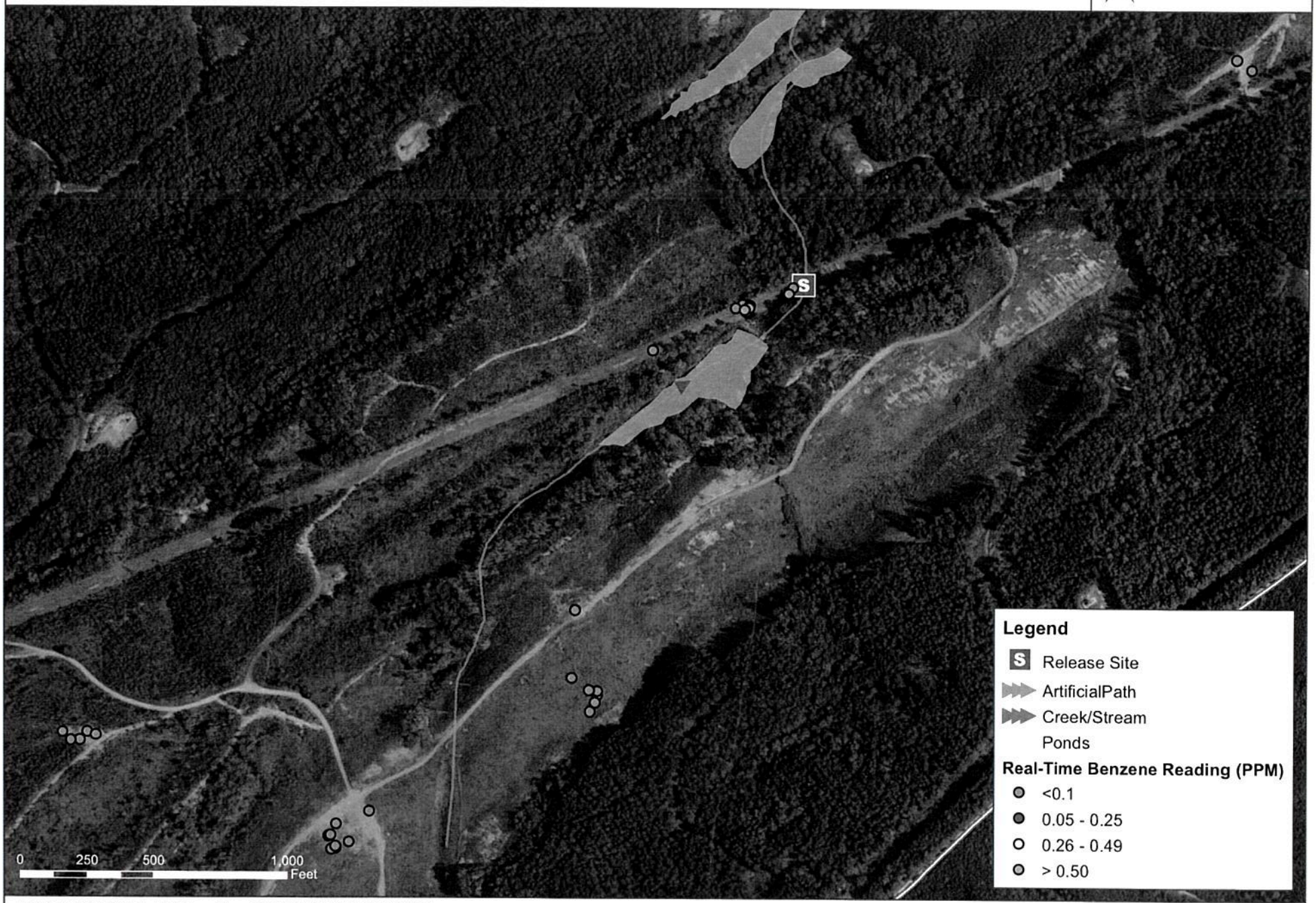
Print Date: *9/17/2016*

**GPS coordinates are approximate*

Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/16/2016 17:00 – 09/17/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

Print Date: *9/17/2016*

**GPS coordinates are approximate*

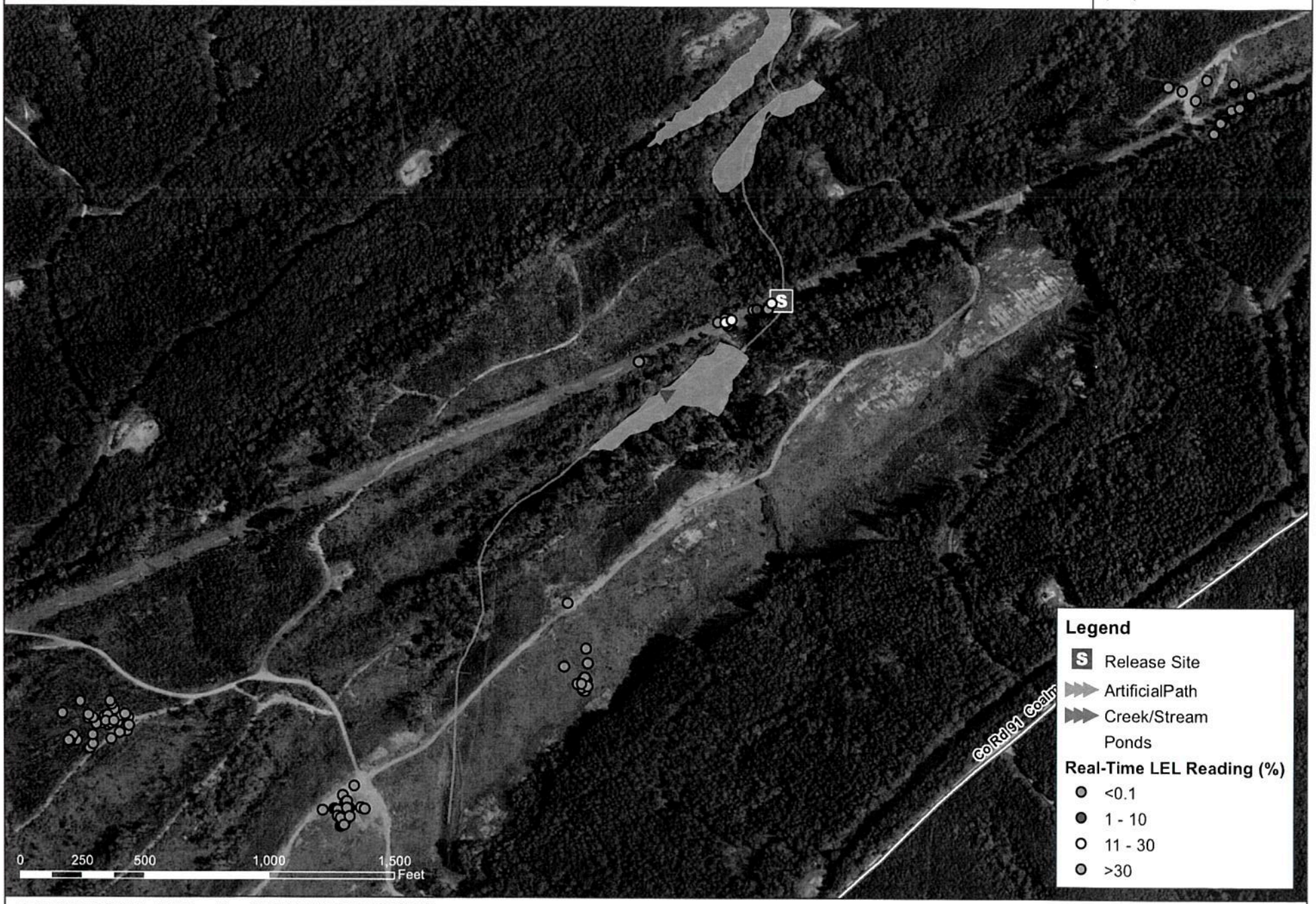
CTEH

Manually-Logged Real-Time Readings | LEL

CR-91 Event | 09/16/2016 17:00 – 09/17/2016 05:00

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

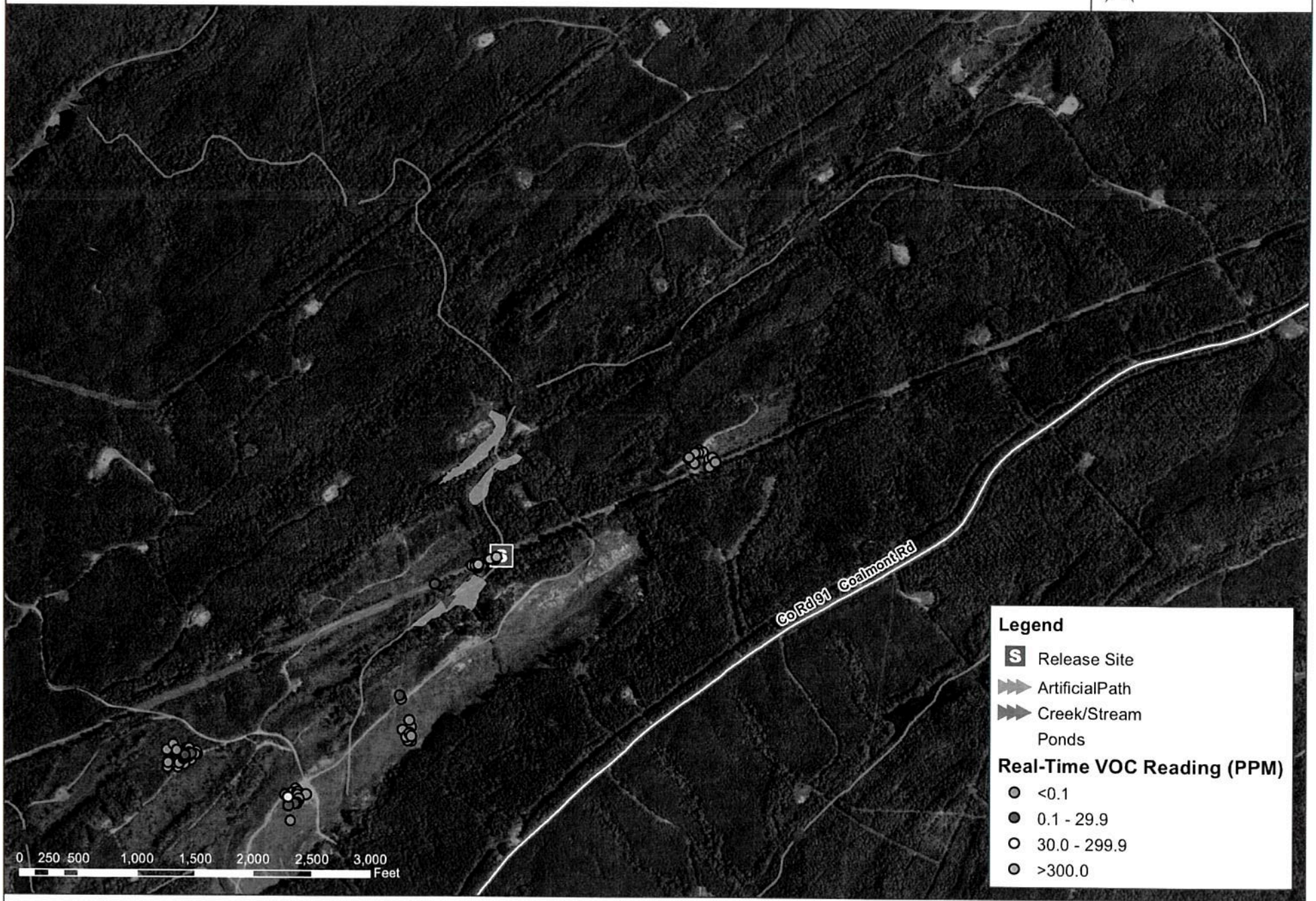
Print Date: *9/17/2016*

**GPS coordinates are approximate*

Manually-Logged Real-Time Readings | VOC

CR-91 Event | 09/16/2016 17:00 – 09/17/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

Print Date: *9/17/2016*

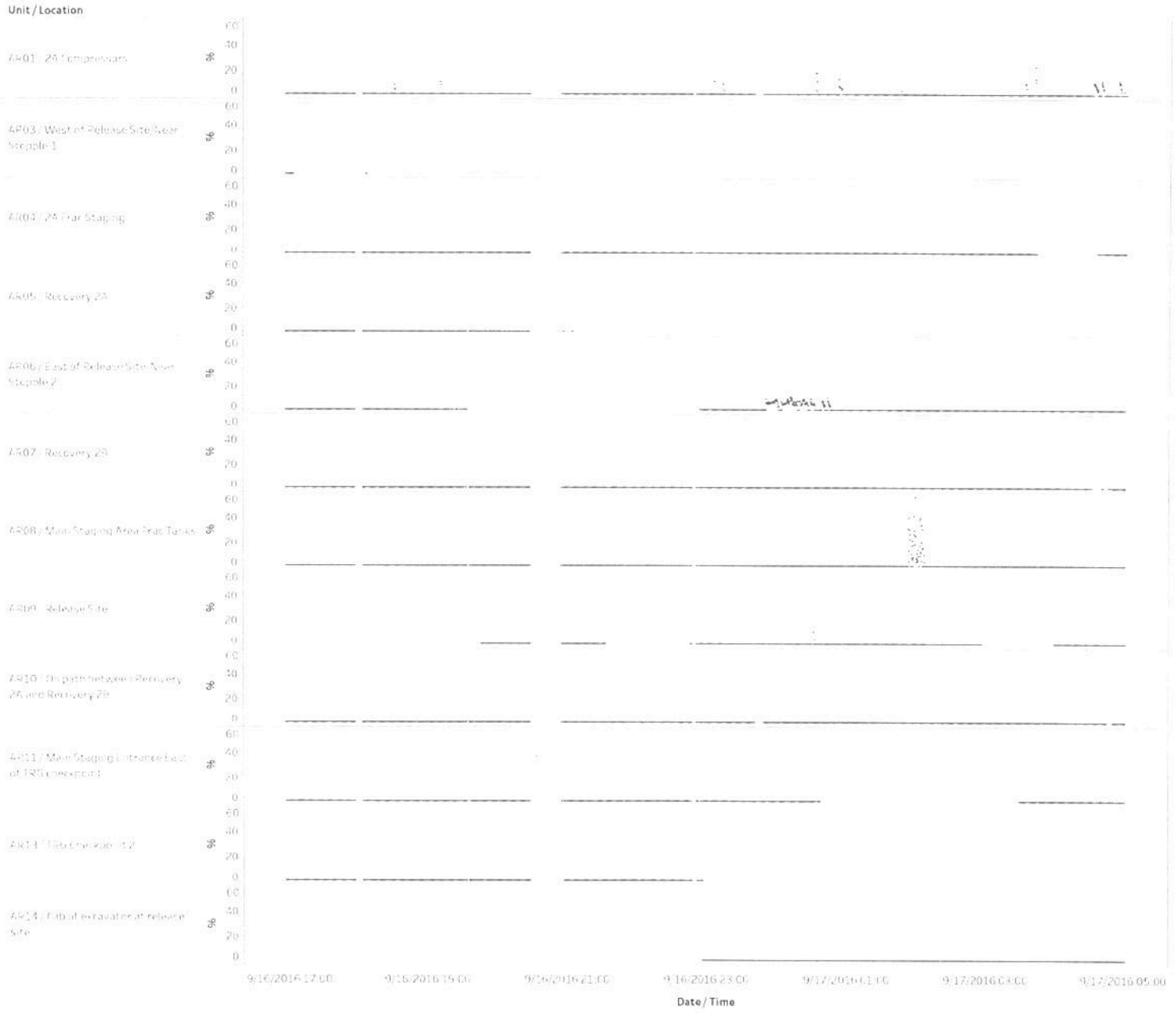
**GPS coordinates are approximate*

Appendix II:

Remote Telemetering Air Monitoring Graphs

Remote Telemetering Real-time Air Monitoring | LEL

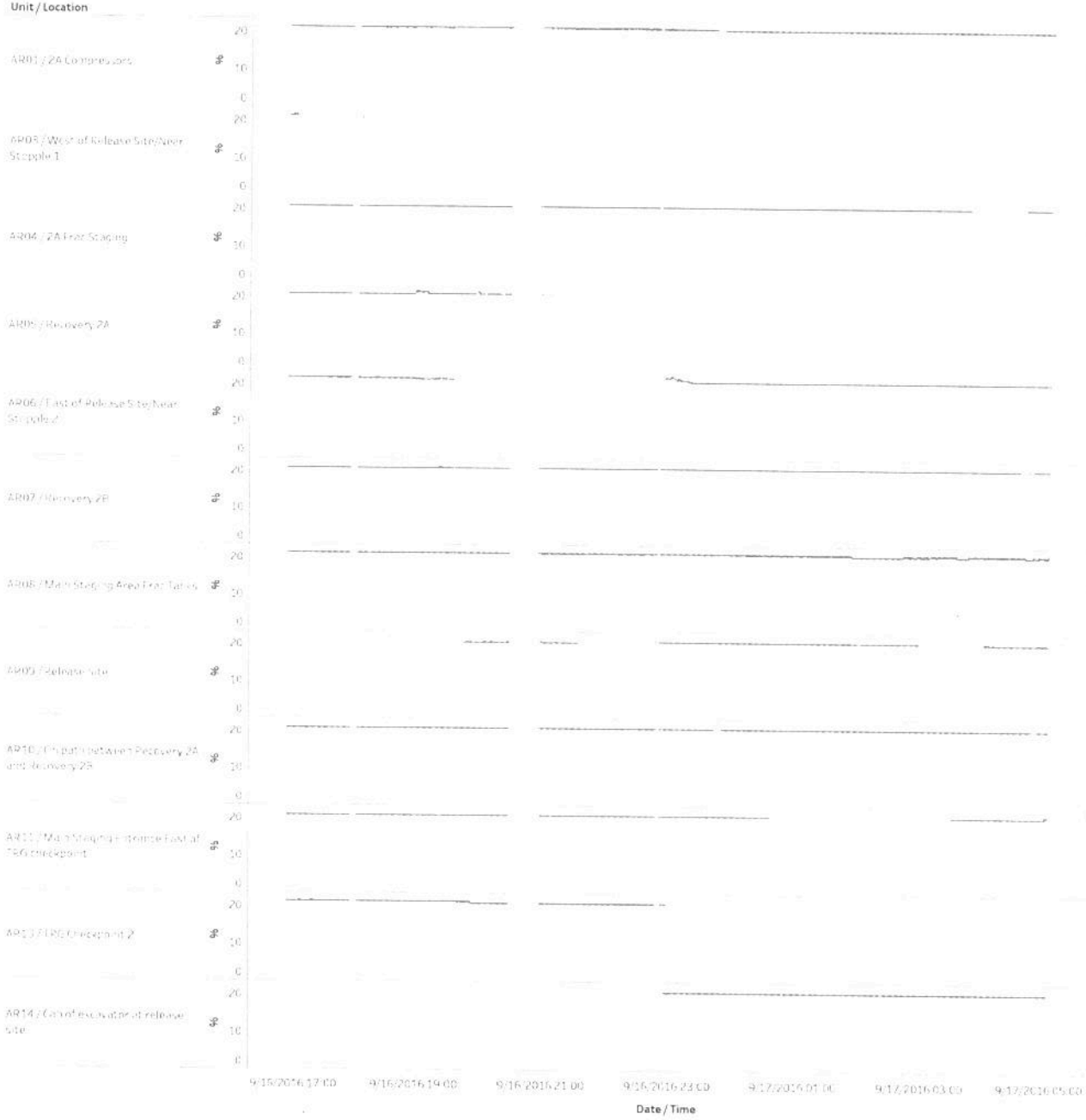
CR-91 Event | 9/16/2016 17:00 to 9/17/2016 04:59



LEL readings are a true representation of atmospheric conditions. Appropriate correction factors have been applied to field values.

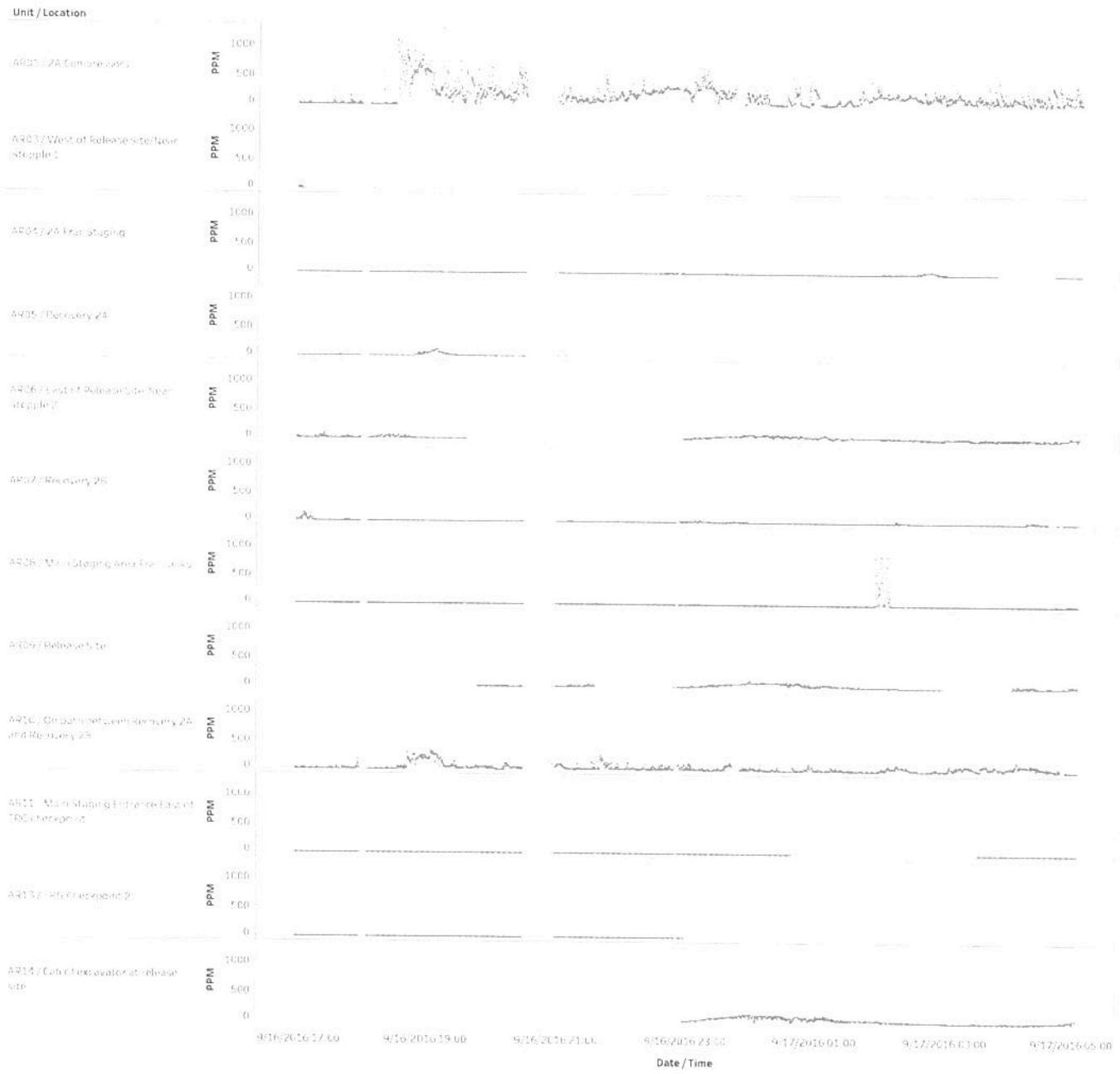
Remote Telemetering Real-time Air Monitoring | Oxygen

CR-91 Event | 9/16/2016 17:00 to 9/17/2016 04:59



Remote Telemetering Real-time Air Monitoring | VOC

CR-91 Event | 9/16/2016 17:00 to 9/17/2016 04:59



VOC readings are at their representative ambient atmospheric conditions (appropriate correction factors have been applied to field values)

CR-91 Event – Shelby County, AL
Preliminary Air Monitoring Summary
September 17, 2016 05:00 - 17:00

Prepared by
Center for Toxicology and Environmental Health, L.L.C. (CTEH®)
On Behalf of Colonial Pipeline

CTEH CENTER FOR TOXICOLOGY AND ENVIRONMENTAL HEALTH, LLC

Introduction

On September 9, 2016, the Center for Toxicology and Environmental Health, L.L.C. (CTEH®) initiated air monitoring in support of response efforts to the gasoline release in Shelby County, AL. This report presents the real-time air monitoring data recorded from September 17 2016 05:00 to September 17, 2016 17:00 CDT.

Real-Time Air Monitoring[1]

Real-time air monitoring was conducted to evaluate the potential airborne presence of gasoline-associated constituents, if any, during response operations. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as total volatile organic compounds (VOCs), oxygen, benzene, and flammability as the percent of the lower explosive limit (LEL) using remote telemetering RAESystems® AreaRAEs, hand-held instruments such as RAESystems® MultiRAE Pro/Plus' and UltraRAEs, as well as Gastec® colorimetric detection tubes.

During this monitoring period, two LEL, six benzene, and 21 VOC action level exceedances were recorded during worker activity monitoring, including instantaneous VOC and benzene readings which were recorded above the action level. When necessary, workers egressed the area in accordance with the approved sampling and analysis plan.

Table 1, below, presents the results of real-time air monitoring using hand-held instruments. Maps of the incident site location and locations of hand-held real-time air monitoring readings are provided in **Appendix I**.

[1] *Real-time air monitoring refers to the use of hand-held instruments that provide near-instantaneous readings of an airborne chemical concentration without the need for laboratory analysis.*

Table 1: Hand-Held Real-Time Air Monitoring Summary[1]
September 17, 2016 05:00 to September 17, 2016 17:00

Location Category	Analyte	Instrument	Count of Readings	Count of Detections	Range of Detections[2,3]
Worker Activity Monitoring	Benzene	UltraRAE	35	5	0.5 - 1.9 ppm
	%LEL	MultiRAE Plus	58	0	<1 %
		MultiRAE Pro	46	0	<1 %
	O_2	MultiRAE Plus	3	2	20.9 - 20.9 %
		MultiRAE Pro	2	2	20.9 - 20.9 %
	VOCs	MultiRAE Plus	57	2	1.7 - 1.7 ppm
		MultiRAE Pro	57	16	0.2 - 159 ppm
Site Characterization	Benzene	UltraRAE	4	1	11.05 - 11.05 ppm
	LEL	MultiRAE Pro	8	5	4 - 25 %
	VOC	MultiRAE Pro	8	8	1 - 512 ppm

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During this monitoring period remote telemetering equipment recorded 5445 detections of VOCs above the CTEH established action level of 30 ppm and 45 detections of LEL above the CTEH established action level of 10% (3% as raw values on LEL sensors).

Table 2 (below) summarizes remote telemetering AreaRAE data for this monitoring period. For this reporting period AreaRAE monitoring data may contain drift events[2]. **Appendix I** and **Appendix II** include location maps and graphs for remote telemetering data, respectively. [4]

[2] Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.

Table 2: Remote Telemetering Real-time Air Monitoring Summary[1,3]

September 17, 2016 05:00 to September 17, 2016 17:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections[2]
AR01	2A Compressors	LEL	2372	0	<1 %
		O_2	2372	2372	20.9 - 20.9 %
		VOC	2372	2012	0.1 - 300.2 ppm
AR03	West of Release Site/Near Stopple 1	LEL	2489	0	<1 %
		O_2	2489	2453	20.9 - 20.9 %
		VOC	2489	1608	0.1 - 4.6 ppm
AR04	2A Frac Tank Staging	LEL	2476	0	<1 %
		O_2	2476	2476	20.9 - 20.9 %
		VOC	2476	909	0.1 - 6.8 ppm
AR05	2A Recovery	LEL	2527	3	1.3 - 3.1 %
		O_2	2527	2527	20.9 - 21.4 %
		VOC	2527	1687	0.1 - 98.8 ppm
AR06	East of Release Site/Near Stopple 2	LEL	2319	0	<1 %
		O_2	2319	2319	20.9 - 20.9 %
		VOC	2319	616	0.1 - 63.6 ppm
AR07	2B Recovery	LEL	2485	0	<1 %
		O_2	2485	2485	20.9 - 21.2 %
		VOC	2485	1317	0.1 - 12.2 ppm
AR08	Main Staging Area Frac Tanks	LEL	2503	0	<1 %
		O_2	2503	2503	20.4 - 20.9 %
		VOC	2503	2500	0.1 - 109.5 ppm
AR09	Release Site	LEL	2514	0	<1 %
		O_2	2514	2514	20.9 - 20.9 %
		VOC	2514	525	0.1 - 71.1 ppm
AR10	On path between Recovery 2A and Recovery 2B.	LEL	2177	0	<1 %
		O_2	2177	2101	20.9 - 21.3 %
		VOC	2177	0	<0.1 ppm
AR11	Main Staging Entrance East of TRG checkpoint	LEL	2090	0	<1 %
		O_2	54	54	20.9 - 20.9 %
		VOC	2090	107	0.1 - 0.4 ppm
AR13	TRG Checkpoint 2 - access to stopple 1, Recovery 2A and 2A Frac Tank Staging Area.	LEL	2006	0	<1 %
		O_2	2006	2006	20.9 - 20.9 %
		VOC	2006	2005	0.1 - 1.5 ppm
AR14	Cab of excavator at release site	LEL	2534	0	<1 %
		O_2	2534	2534	20.9 - 20.9 %
		VOC	2534	2534	0.6 - 59 ppm

[1]*Please note: The data displayed here has not undergone complete QA/QC analysis and is presented in a preliminary format.*

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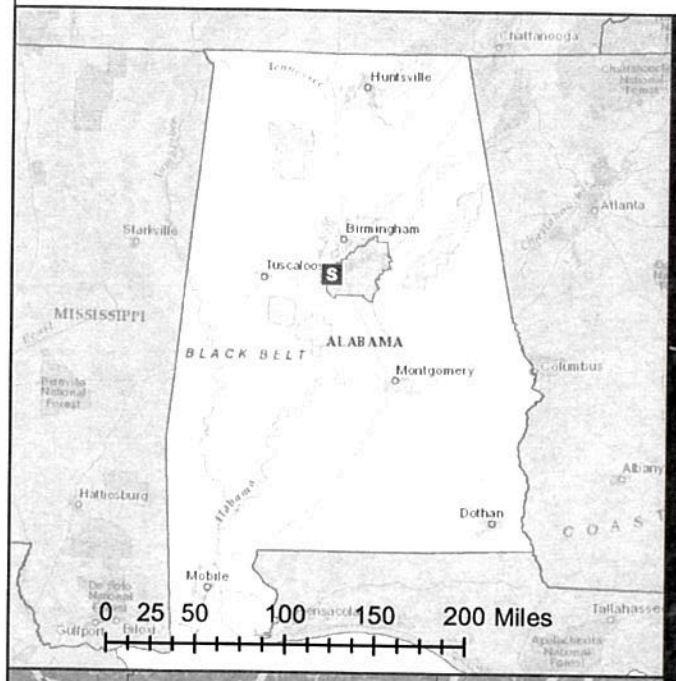
Appendix I:

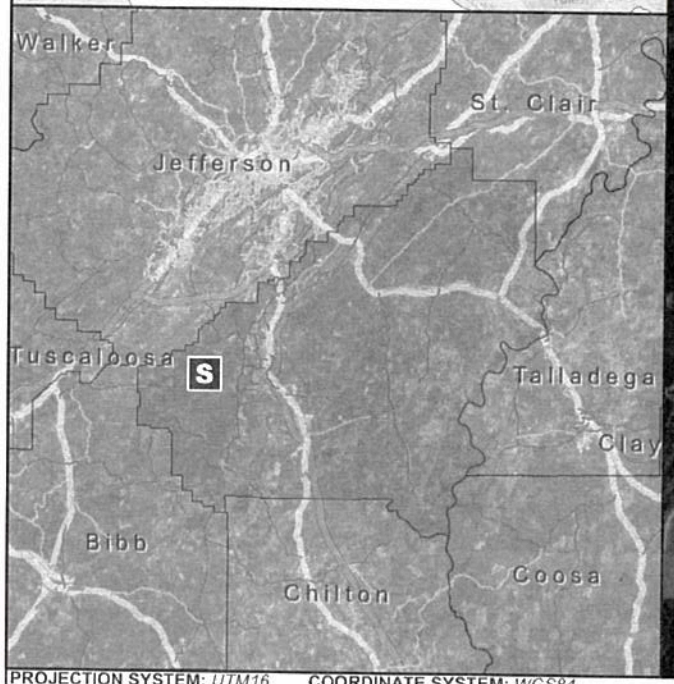
Site Location, Hand-Held Real-Time Air Monitoring Location, and Remote Telemetering Air Monitoring Location Maps

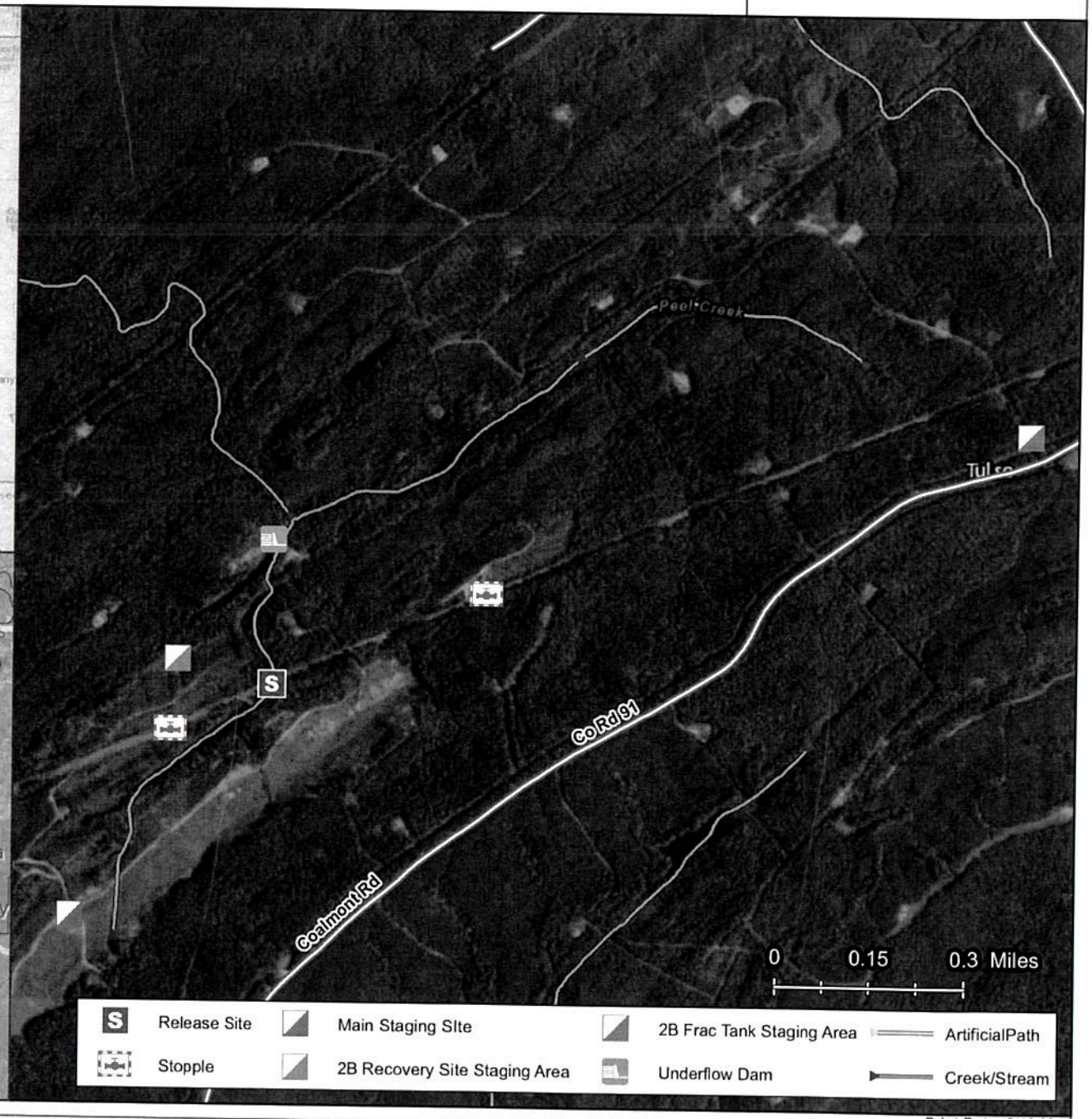
CR-91 Event

Site Location

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL







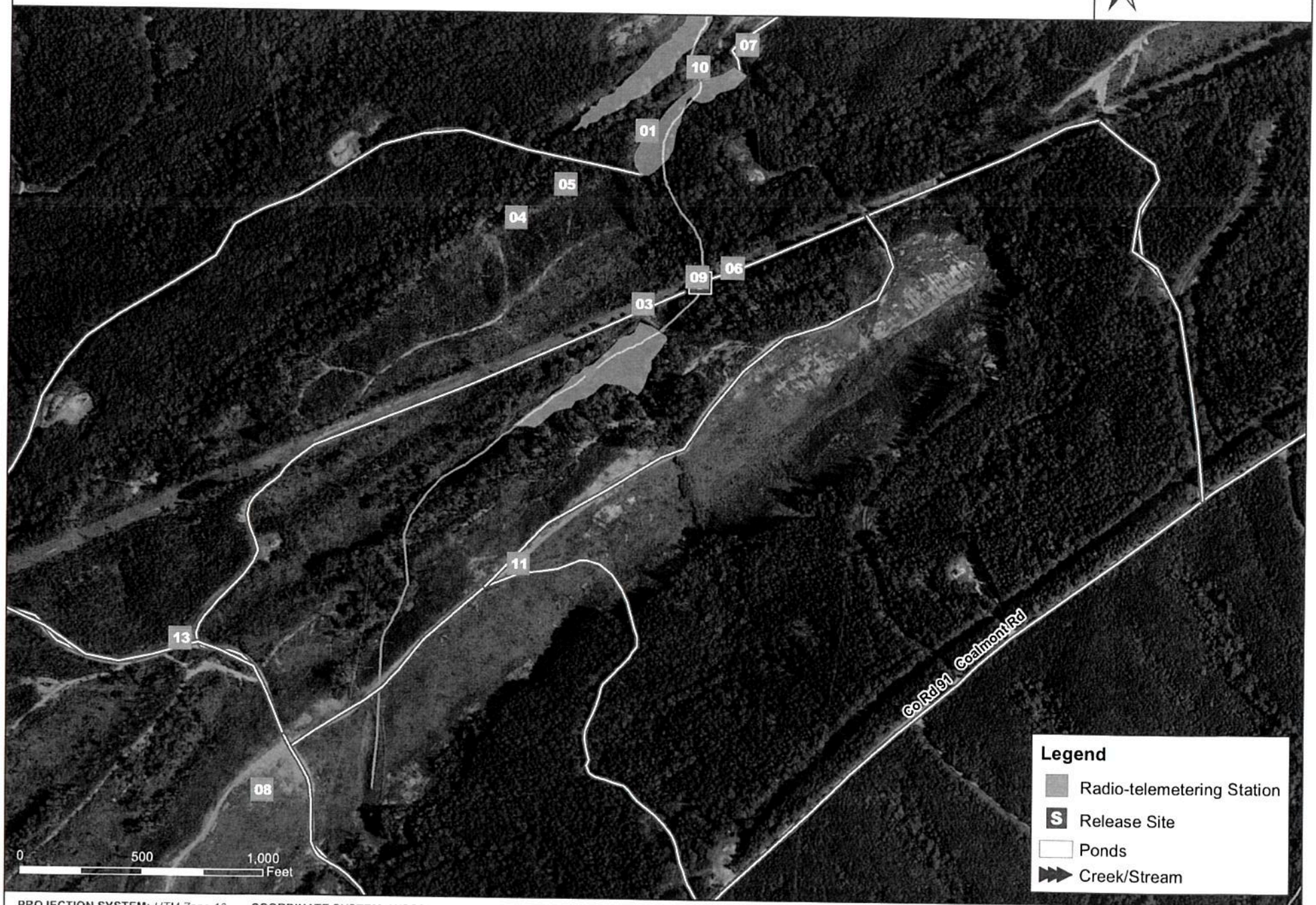
PROJECTION SYSTEM: *UTM16* COORDINATE SYSTEM: *WGS84*

Print Date: *9/13/2016*

Radio-telemetering Real-time Air Monitoring Station Locations

CR-91 Event 9/17/2016

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, LA



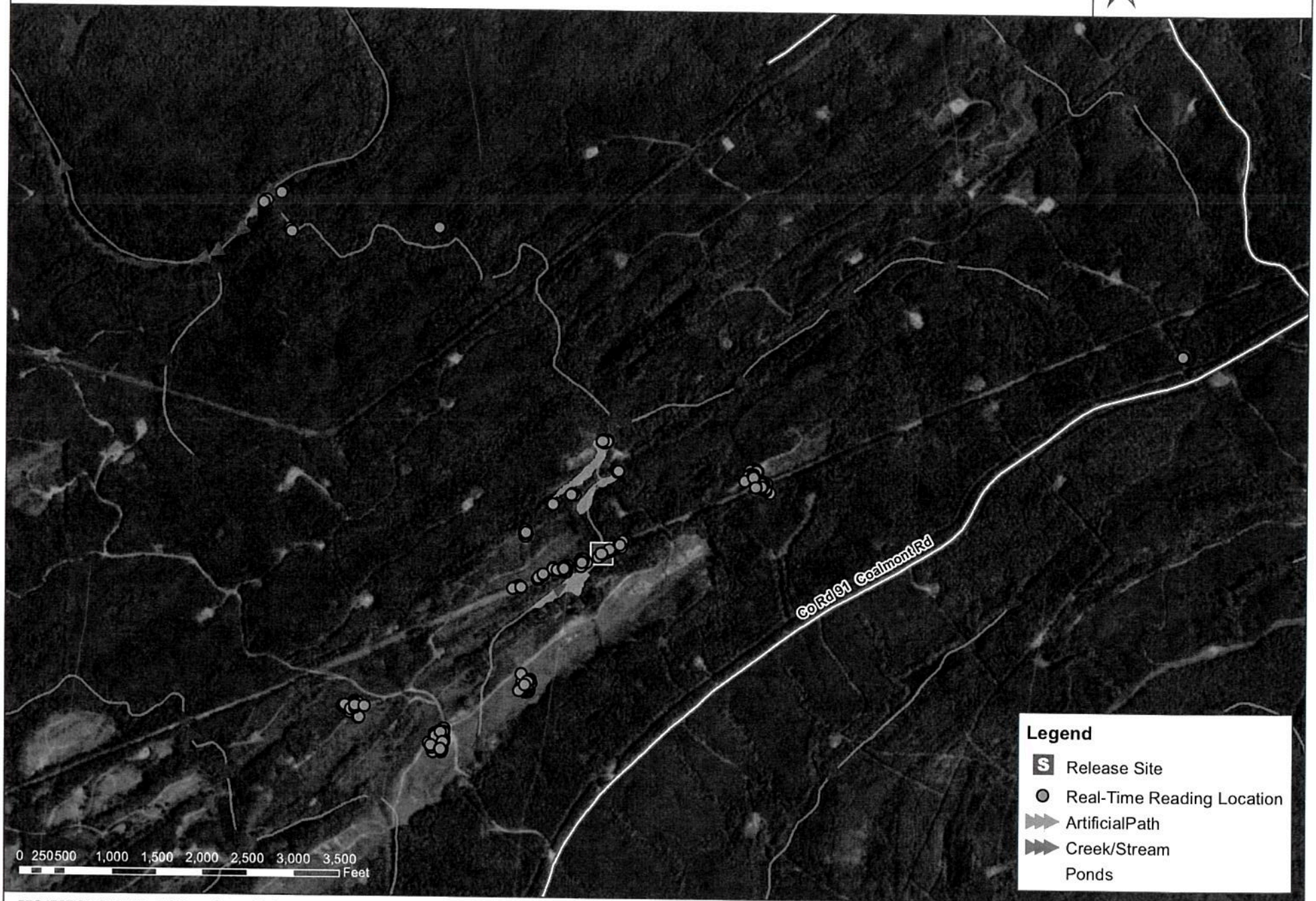
PROJECTION SYSTEM: *UTM Zone 16* COORDINATE SYSTEM: *WGS84*

Print Date: *9/17/2016*

Manually-Logged Real-Time Reading Locations

CR-91 Event | 09/17/2016 05:00 – 09/17/2016 17:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

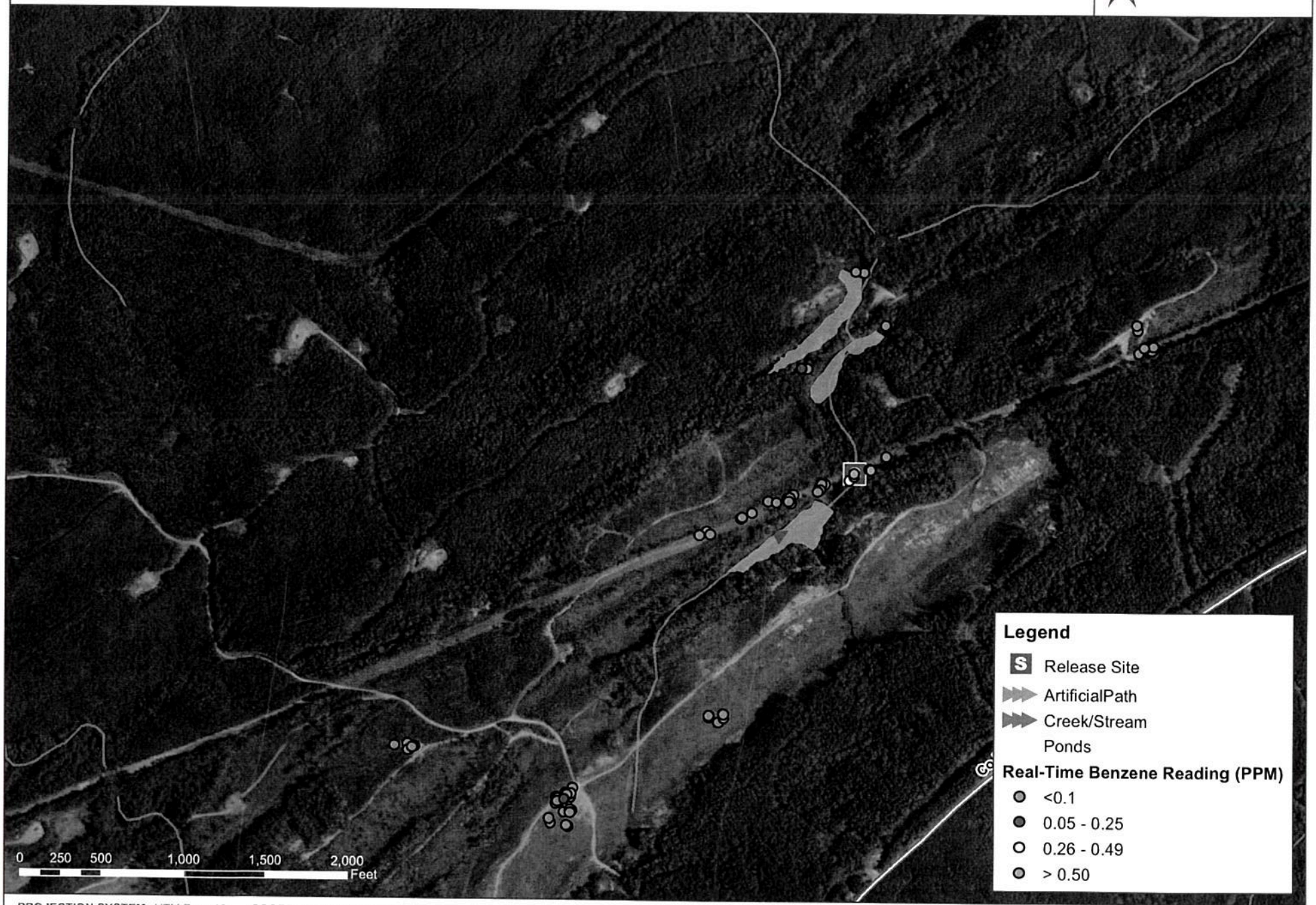
Print Date: *9/17/2016*

**GPS coordinates are approximate*

Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/17/2016 05:00 – 09/17/2016 17:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

Print Date: *9/17/2016*

**GPS coordinates are approximate*

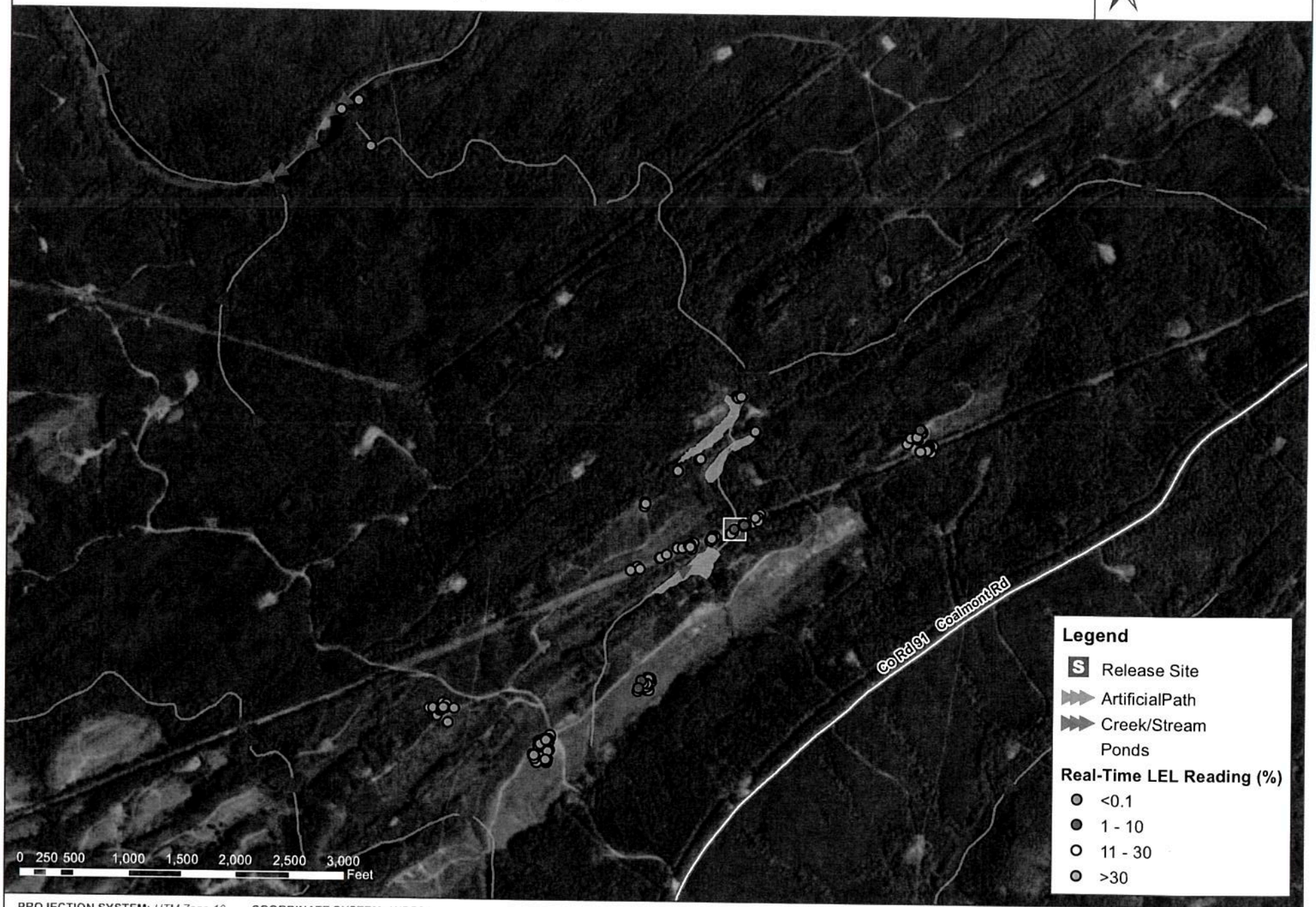
CTEH

Manually-Logged Real-Time Readings | LEL

CR-91 Event | 09/17/2016 05:00 – 09/17/2016 17:00

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

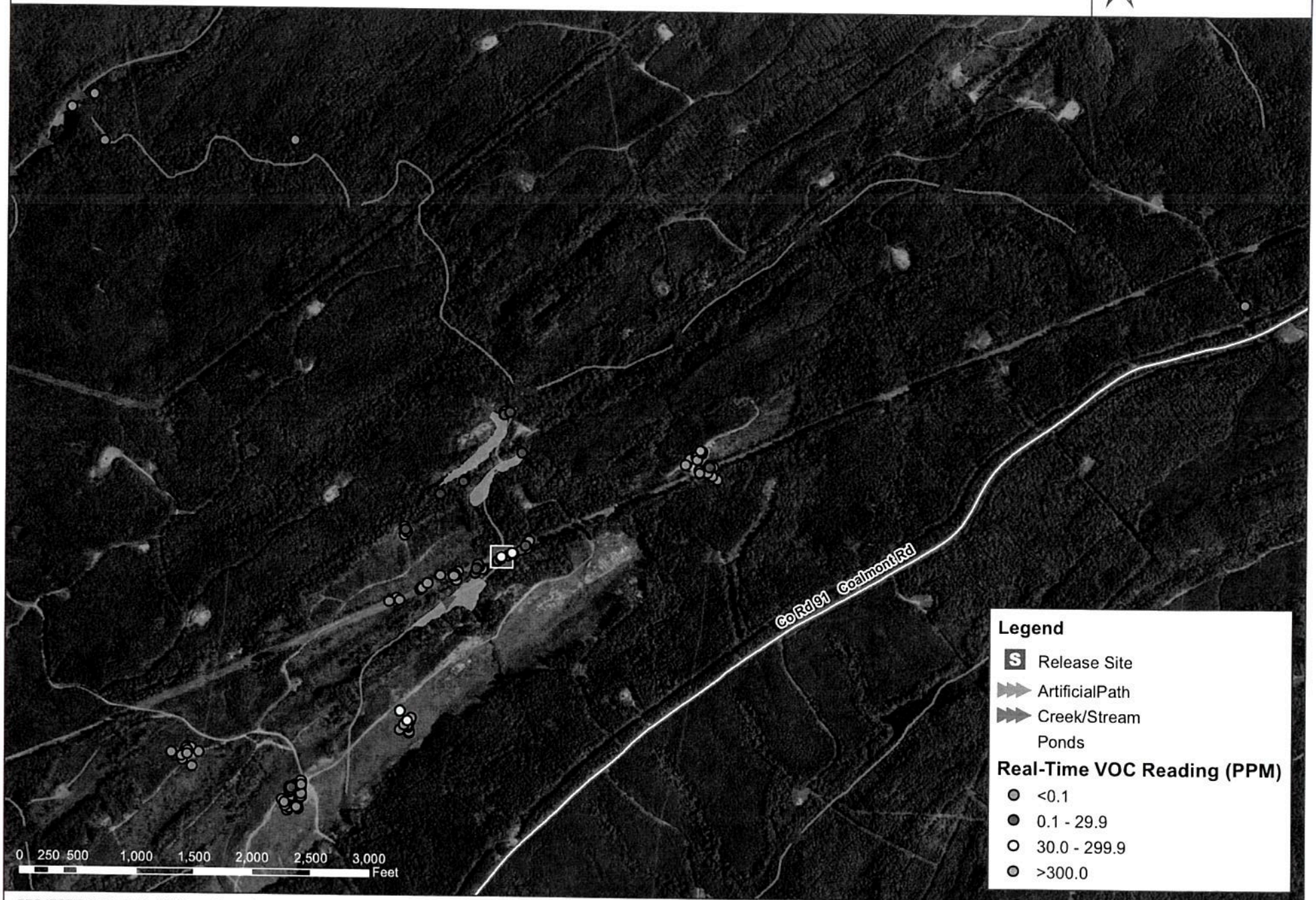
Print Date: *9/17/2016*

*GPS coordinates are approximate

Manually-Logged Real-Time Readings | VOC

CR-91 Event | 09/17/2016 05:00 – 09/17/2016 17:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

Print Date: *9/18/2016*

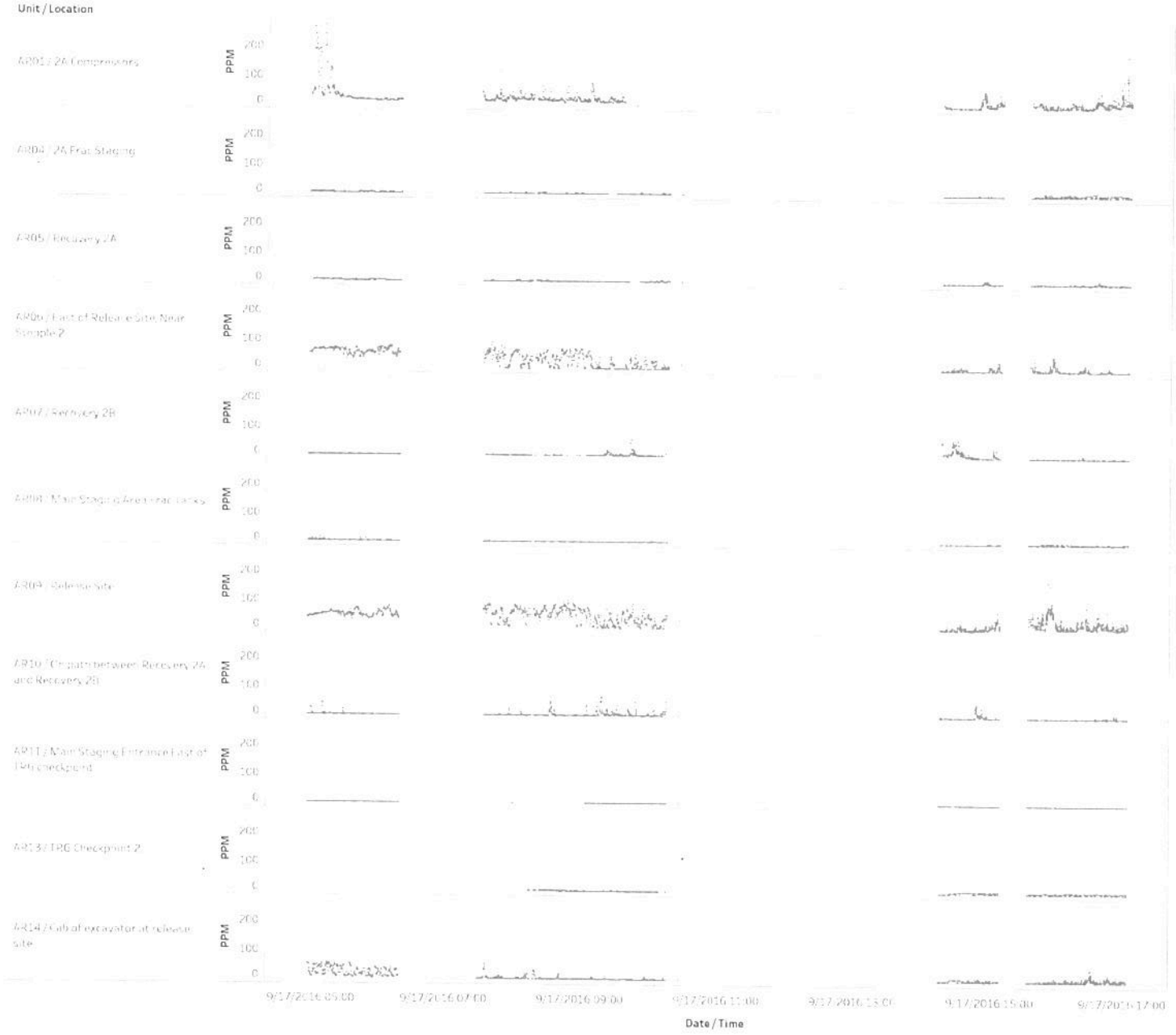
**GPS coordinates are approximate*

Appendix II:

Remote Telemetering Air Monitoring Graphs

Remote Telemetering Real-time Air Monitoring | VOC

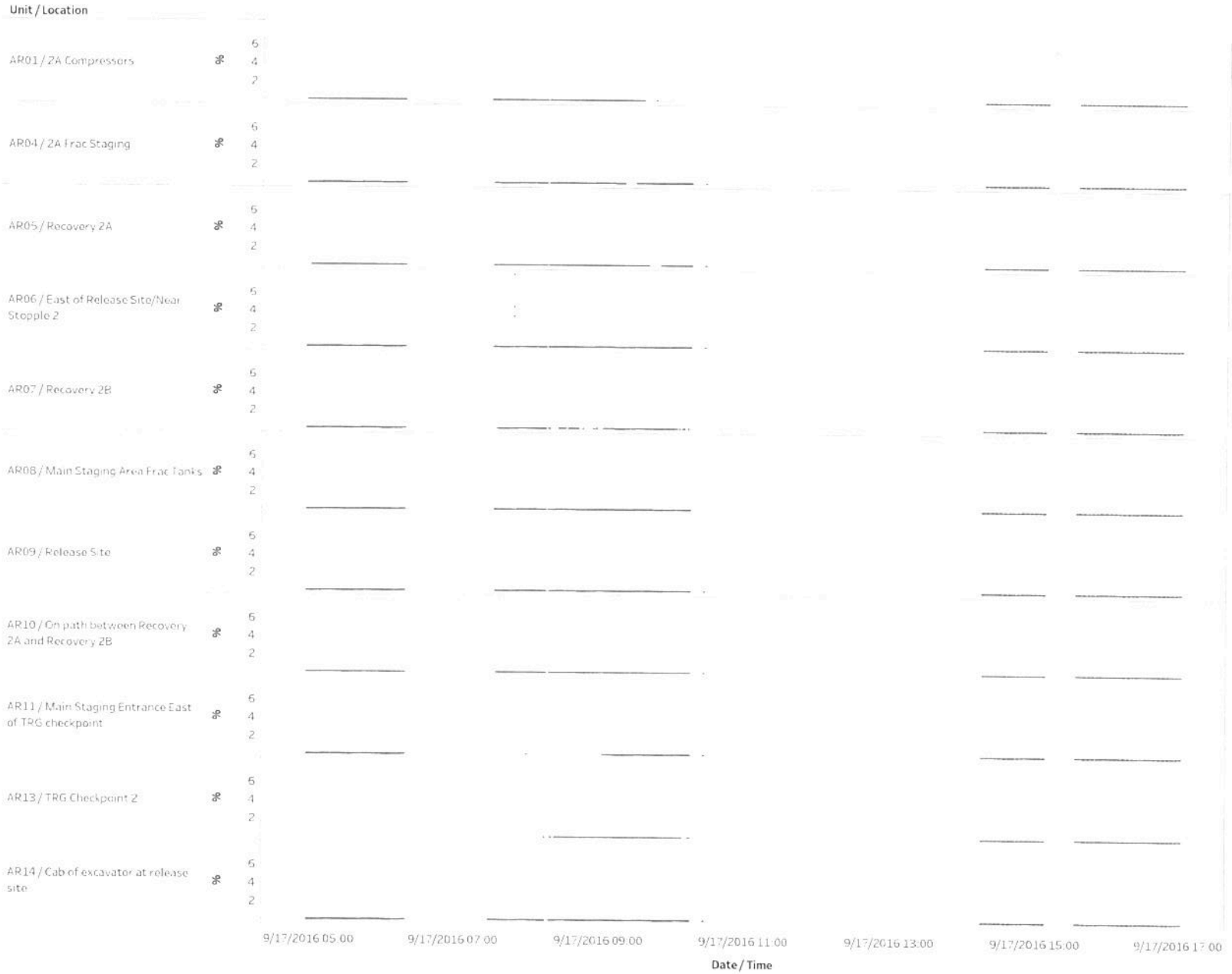
CR-91 Event | 9/17/2016 05:00 to 9/17/2016 16:59



VOC readings are a true representation of atmospheric conditions (appropriate correction factors have been applied to field values).

Remote Telemetering Real-time Air Monitoring | LEL

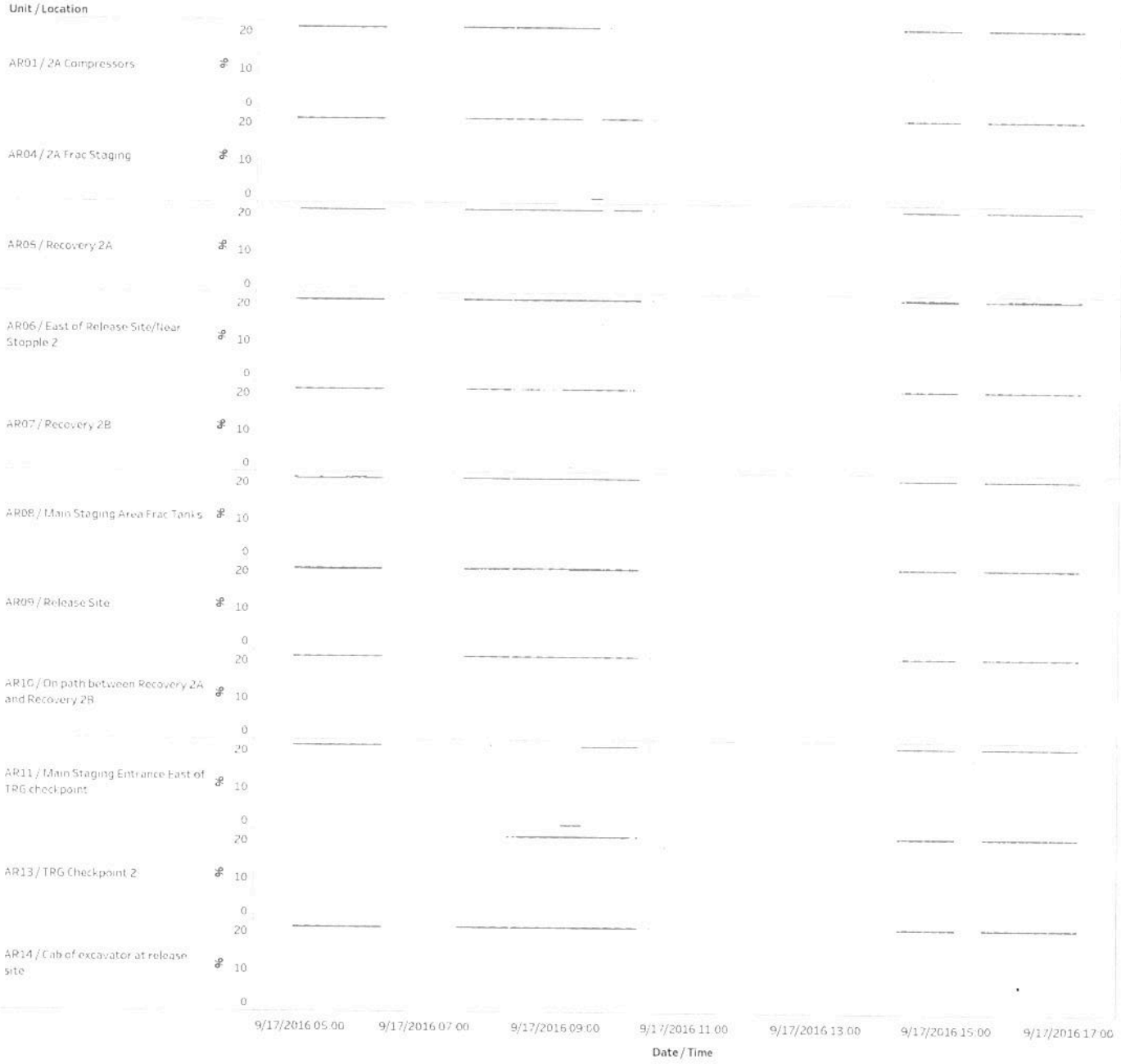
CR-91 Event | 9/17/2016 05:00 to 9/17/2016 16:59



LEL readings are a true representation of atmospheric conditions (appropriate correction factors have been applied to field values).

Remote Telemetering Real-time Air Monitoring | Oxygen

CR-91 Event | 9/17/2016 05:00 to 9/17/2016 16:59



CR-91 Event – Shelby County, AL
Preliminary Air Monitoring Summary
September 18, 2016 05:00

Prepared by
Center for Toxicology and Environmental Health, L.L.C. (CTEH®)
On Behalf of Colonial Pipeline

CTEH CENTER FOR TOXICOLOGY AND ENVIRONMENTAL HEALTH, LLC

Introduction

On September 9, 2016, the Center for Toxicology and Environmental Health, L.L.C. (CTEH®) initiated air monitoring in support of response efforts to the gasoline release in Shelby County, AL. This report presents the real-time air monitoring data recorded from September 17 2016 17:00 to September 18, 2016 05:00 CDT.

Real-Time Air Monitoring[1]

Real-time air monitoring was conducted to evaluate the potential airborne presence of gasoline-associated constituents, if any, during response operations. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as total volatile organic compounds (VOCs), oxygen, benzene, and flammability as the percent of the lower explosive limit (LEL) using remote telemetering RAESystems® AreaRAEs, hand-held instruments such as RAESystems® MultiRAE Pro/Plus' and UltraRAEs, as well as Gastec® colorimetric detection tubes.

During this monitoring period, two LEL and six VOC action level exceedances were recorded during worker activity monitoring, including instantaneous VOC and benzene readings which were recorded above the action level. When necessary, workers egressed the area in accordance with the approved sampling and analysis plan.

Table 1, below, presents the results of real-time air monitoring using hand-held instruments. Maps of the incident site location and locations of hand-held real-time air monitoring readings are provided in **Appendix I**.

[1] *Real-time air monitoring refers to the use of hand-held instruments that provide near-instantaneous readings of an airborne chemical concentration without the need for laboratory analysis.*

Table 1: Hand-Held Real-Time Air Monitoring Summary[1]

September 17, 2016 17:00 to September 18, 2016 05:00

Location Category	Analyte	Instrument	Count of Readings	Count of Detections	Range of Detections[2,3]
Worker Activity Monitoring	Benzene	Gastec #121L	1	0	<0.05 ppm
		UltraRAE	73	10	0.05 - 0.3 ppm
	%LEL	MultiRAE Plus	55	0	<1 %
		MultiRAE Pro	149	3	3 - 6 %
	O_2	MultiRAE Pro	2	2	20.9 - 20.9 %
	VOCs	MultiRAE Plus	47	5	0.1 - 9 ppm
		MultiRAE Pro	159	57	0.1 - 638 ppm
Site Characterization	%LEL	MultiRAE Pro	3	2	4 - 8 %
	VOC	MultiRAE Pro	3	3	125 - 352.8 ppm

[1]Please Note: The data displayed in the above table has not undergone complete QC analysis and is presented in a preliminary format.
[2]Maximum detections preceded by the "<" symbol are considered non-detections below the instrument limit of detection (LoD) value to the right.
[3]Numbers are the raw values, no correction factors have been applied.

During this monitoring period remote telemetering equipment recorded 7851 detections of VOCs above the CTEH established action level of 30 ppm and 11 detections of LEL above the CTEH established action level of 10% (3% as raw values on LEL sensors).

Table 2 (below) summarizes remote telemetering AreaRAE data for this monitoring period. For this reporting period AreaRAE monitoring data may contain drift events[2]. **Appendix I** and **Appendix II** include location maps and graphs for remote telemetering data, respectively. [4]

[2] Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.

Table 2: Remote Telemetering Real-time Air Monitoring Summary[1,3]

September 17, 2016 17:00 to September 18, 2016 05:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections[2]
AR01	2A Compressors	LEL	8382	38	1.1 - 4.9 %
		O_2	8382	8382	20.9 - 20.9 %
		VOC	8382	6867	0.1 - 276.5 ppm
AR04	2A Frac Tank Staging	LEL	7315	0	<1 %
		O_2	7315	7315	20.9 - 20.9 %
		VOC	7315	7315	0.2 - 105.4 ppm
AR05	2A Recovery	LEL	8464	0	<1 %
		O_2	8464	8464	20.9 - 20.9 %
		VOC	8464	1908	0.1 - 24.5 ppm
AR06	East of Release Site/Near Stopple 2	LEL	7397	0	<1 %
		O_2	7397	7397	20.9 - 21.4 %
		VOC	7397	4208	0.1 - 123.7 ppm
AR07	2B Recovery	LEL	8368	0	<1 %
		O_2	8368	8368	20.9 - 20.9 %
		VOC	8368	3779	0.1 - 14.8 ppm
AR08	Main Staging Area Frac Tanks	LEL	7242	0	<1 %
		O_2	7242	7242	20.9 - 20.9 %
		VOC	7242	7242	0.5 - 736.4 ppm
AR09	Release Site	LEL	8382	0	<1 %
		O_2	8382	8382	20.9 - 20.9 %
		VOC	8382	8382	4.8 - 166.7 ppm
AR10	On path between Recovery 2A and Recovery 2B.	LEL	8380	0	<1 %
		O_2	8380	8380	20.9 - 20.9 %
		VOC	8380	5279	0.1 - 123.5 ppm
AR11	Main Staging Entrance East of TRG checkpoint	LEL	8398	0	<1 %
		O_2	8398	8398	20.9 - 20.9 %
		VOC	8398	0	<0.1 ppm
AS12	Boom Site #2	LEL	2380	0	<1 %
		VOC	2380	1	0.3 ppm
AR13	TRG Checkpoint 2 - access to stopple 1, Recovery 2A and 2A Frac Tank Staging Area.	LEL	8390	0	<1 %
		O_2	8390	8390	20.9 - 20.9 %
		VOC	8390	8390	0.3 - 2.1 ppm
AR14	Cab of excavator at release site	LEL	7815	0	<1 %
		O_2	7815	7815	20.9 - 20.9 %
		VOC	7815	7815	0.7 - 30.1 ppm

[1]*Please note: The data displayed here has not undergone complete QA/QC analysis and is presented in a preliminary format.*

[2]*Maximum detections preceded by the "<" symbol are considered at the limit of detection (LoD) value to the right.*

[3]*LEL and VOC values are raw values, correction factors have not been applied.*

Appendix I:

Site Location, Hand-Held Real-Time Air Monitoring Location, and Remote Telemetering Air Monitoring Location Maps

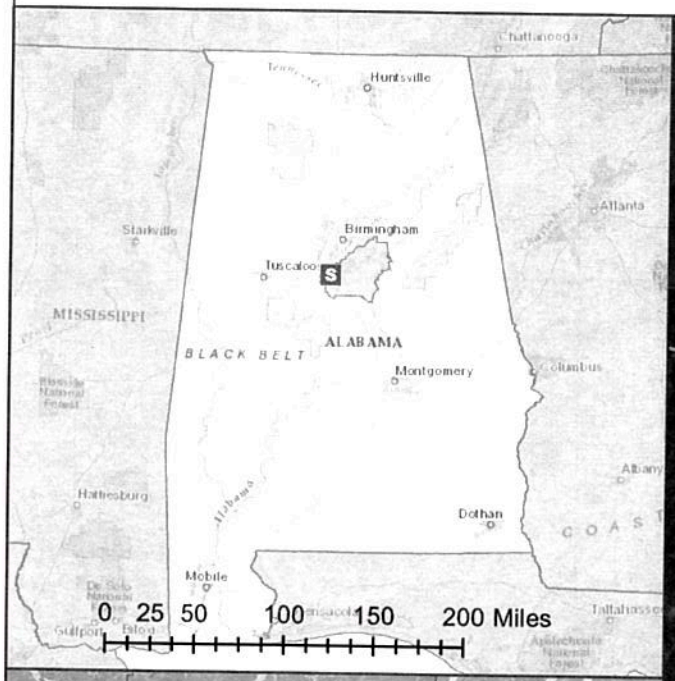
CTEH

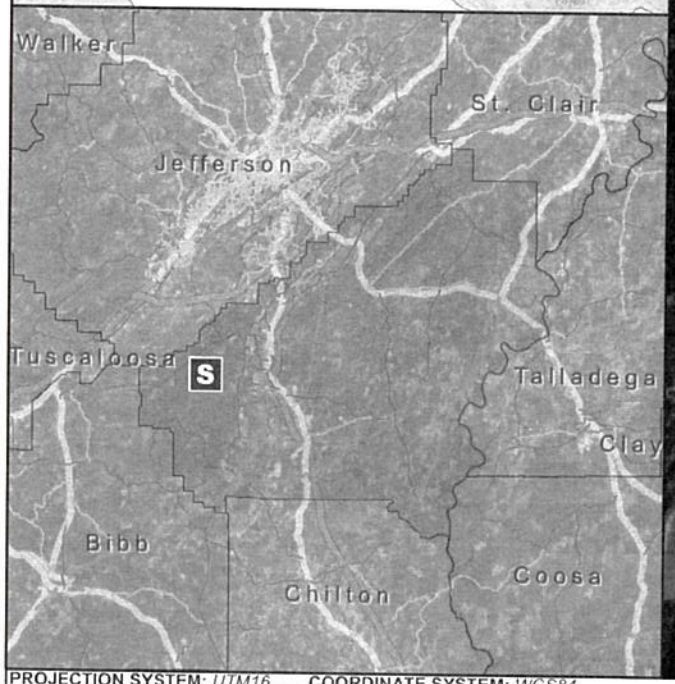
CR-91 Event

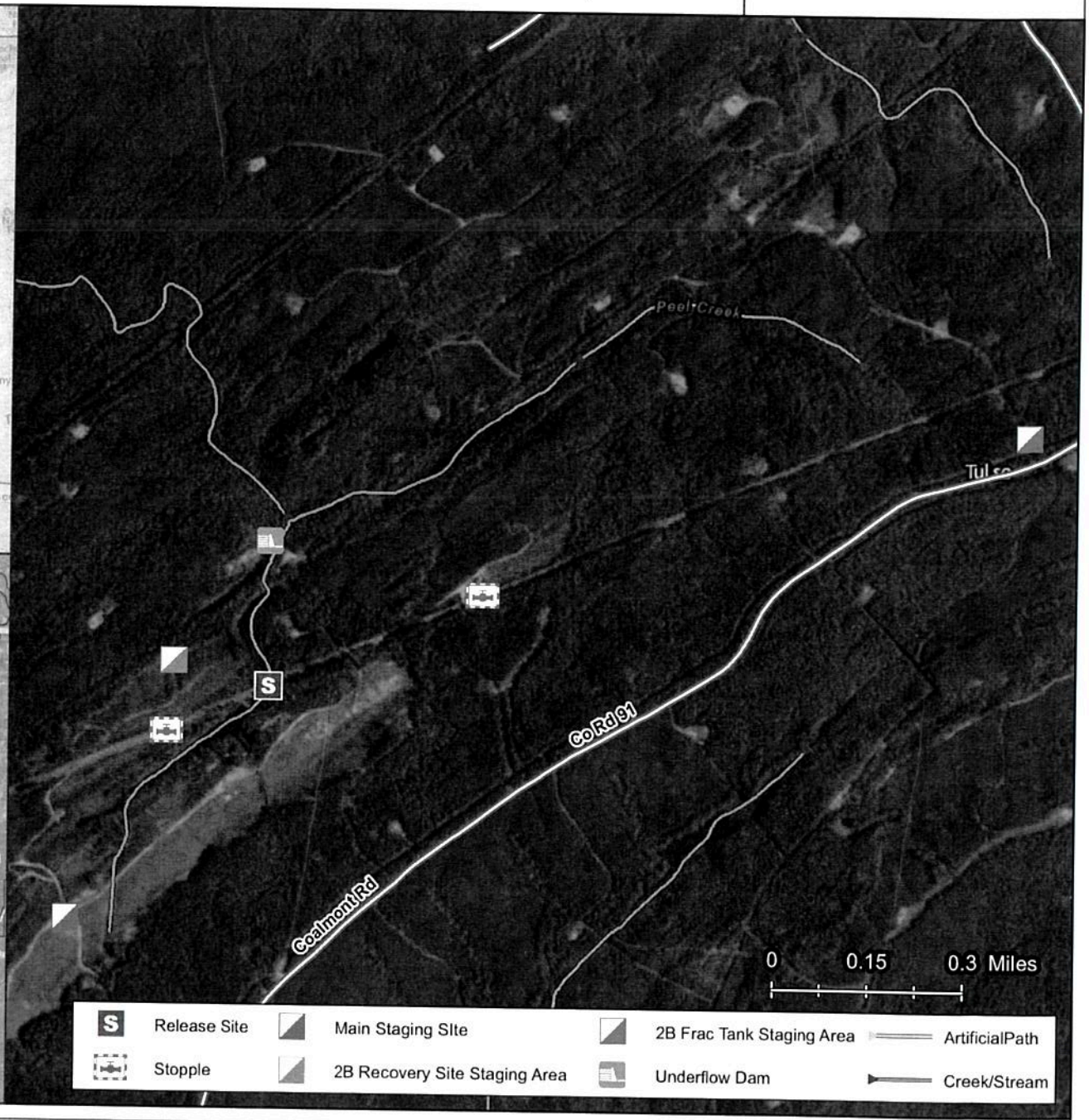
Site Location

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL







PROJECTION SYSTEM: *UTM16* COORDINATE SYSTEM: *WGS84*

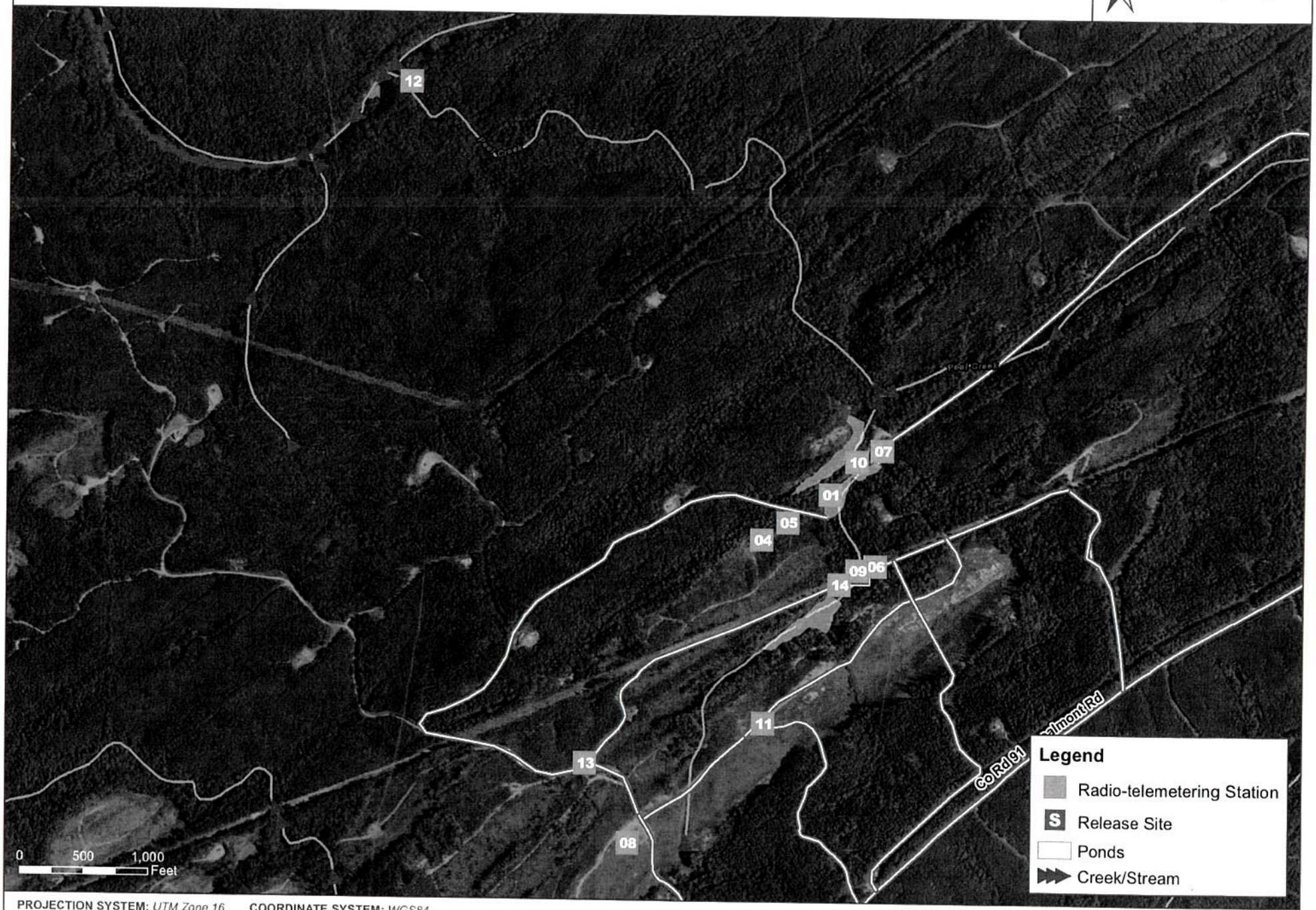
Print Date: *9/13/2016*

Radio-telemetering Real-time Air Monitoring Station Locations

CR-91 Event 9/18/2016

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, LA



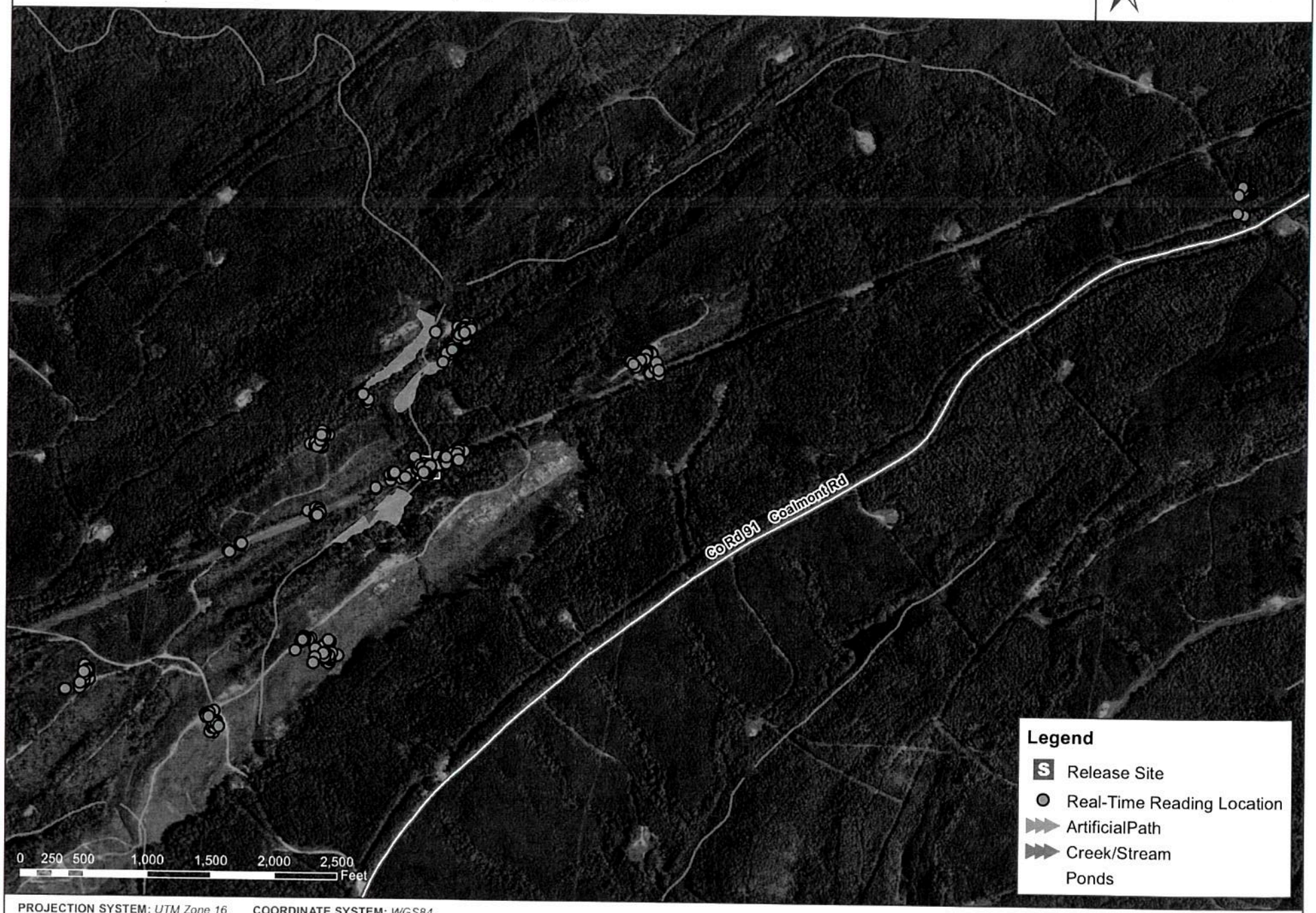
PROJECTION SYSTEM: *UTM Zone 16* COORDINATE SYSTEM: *WGS84*

Print Date: *9/18/2016*

Manually-Logged Real-Time Reading Locations

CR-91 Event | 09/17/2016 17:00 – 09/17/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

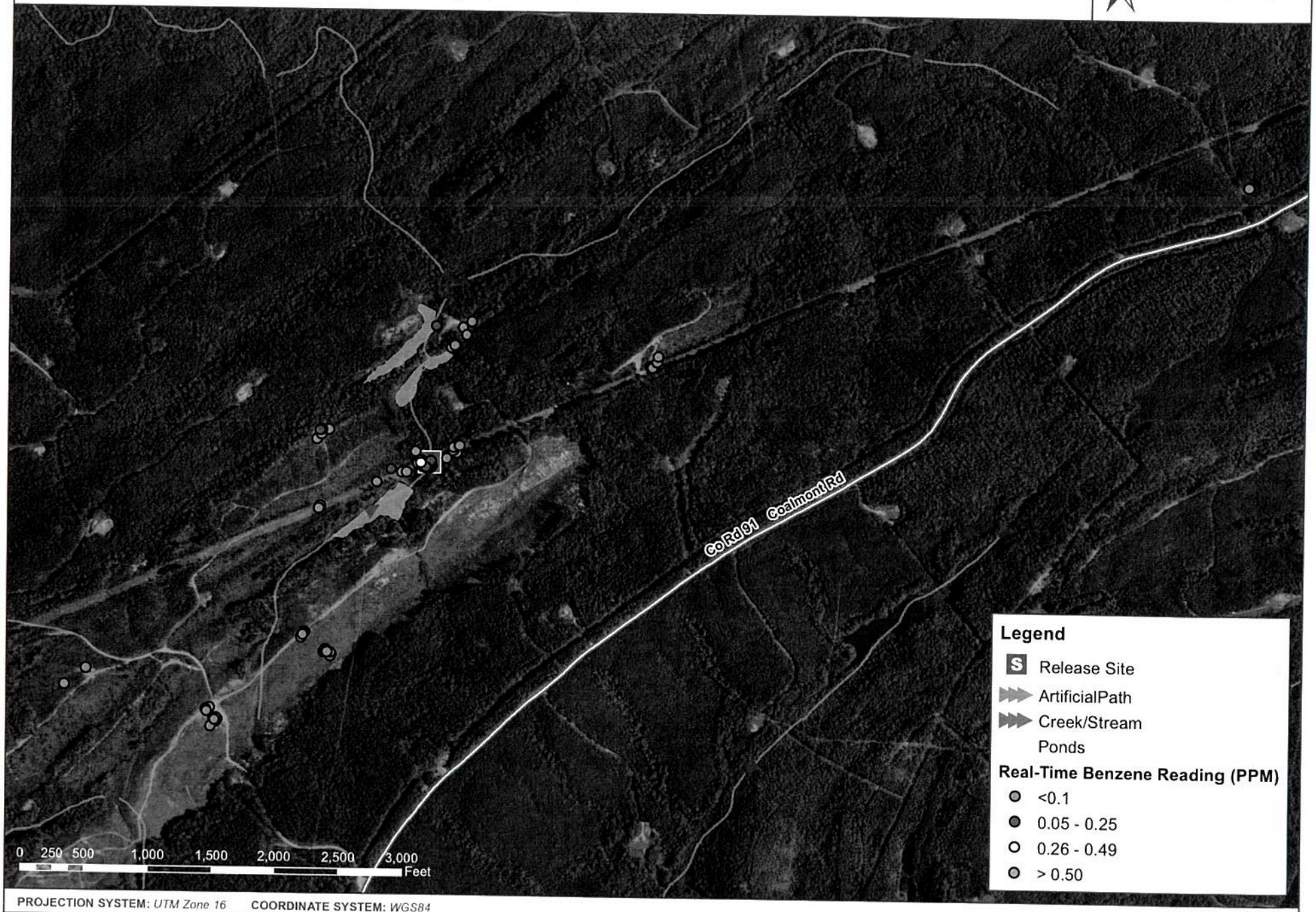
Print Date: *9/18/2016*

**GPS coordinates are approximate*

Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/17/2016 17:00 – 09/17/2016 05:00

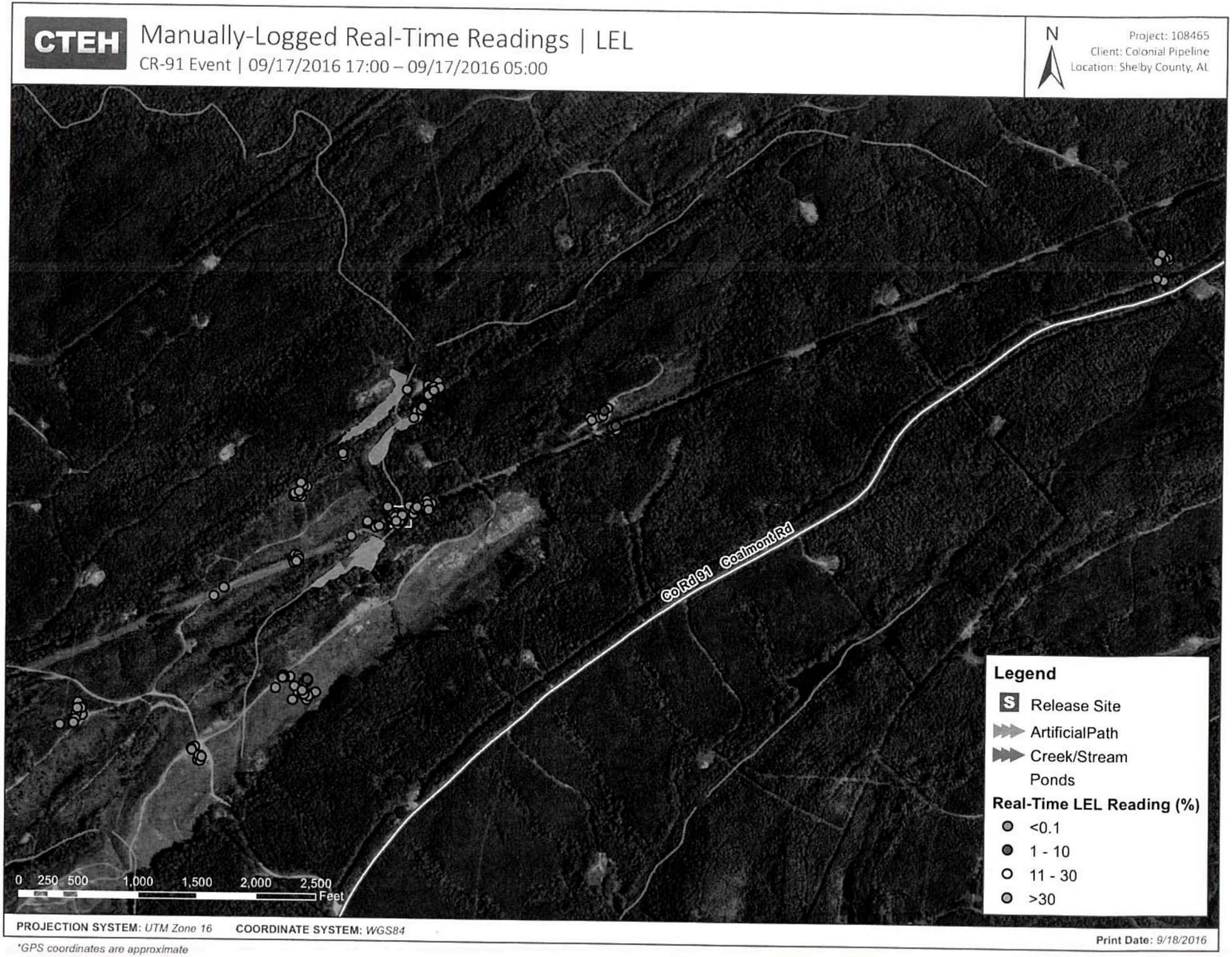
Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL

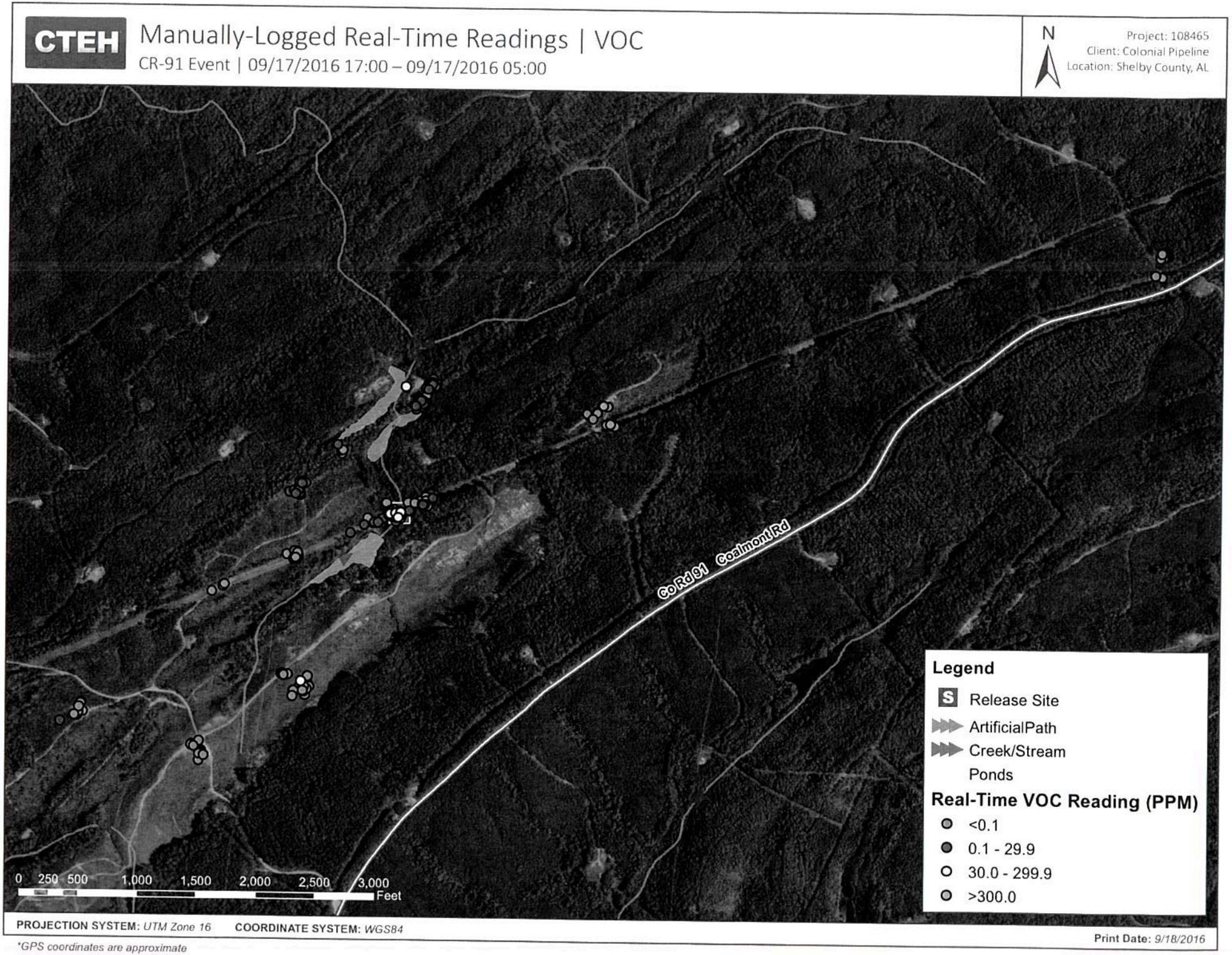


PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

Print Date: *9/18/2016*

**GPS coordinates are approximate*


CTEH
Manually-Logged Real-Time Readings | LEL
CR-91 Event | 09/17/2016 17:00 – 09/17/2016 05:00
N
Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL
Co Rd 91 Coalmont Rd
0 250 500 1,000 1,500 2,000 2,500
Feet
Legend
Release Site
ArtificialPath
Creek/Stream
Ponds
Real-Time LEL Reading (%)
<0.1
1 - 10
11 - 30
>30
PROJECTION SYSTEM: UTM Zone 16
COORDINATE SYSTEM: WGS84
Print Date: 9/18/2016
*GPS coordinates are approximate

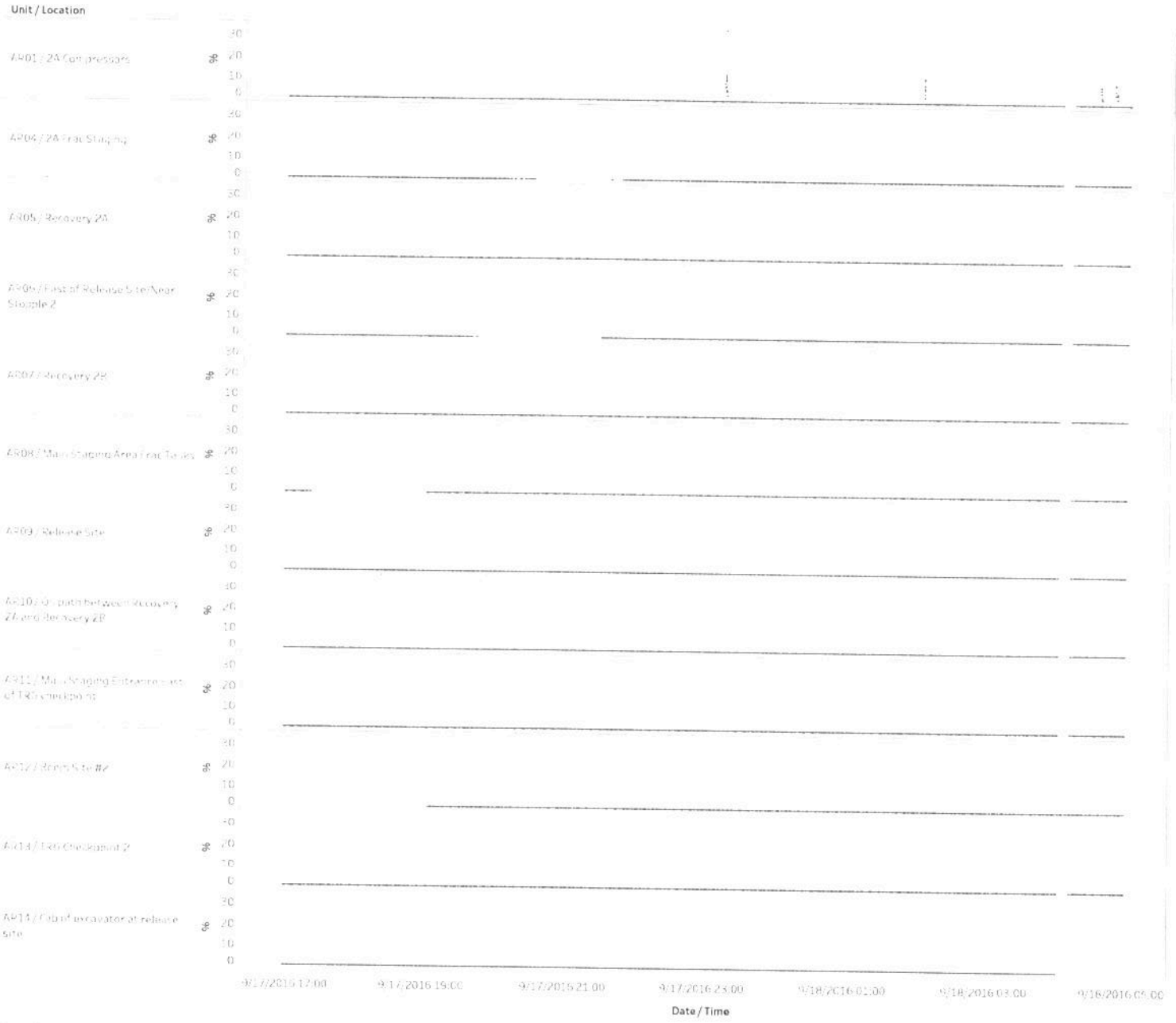

CTEH
Manually-Logged Real-Time Readings | VOC
CR-91 Event | 09/17/2016 17:00 – 09/17/2016 05:00
N
Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL
Co Rd 91 Coalmont Rd
0 250 500 1,000 1,500 2,000 2,500 3,000
Feet
Legend
Release Site
ArtificialPath
Creek/Stream
Ponds
Real-Time VOC Reading (PPM)
<0.1
0.1 - 29.9
30.0 - 299.9
>300.0
PROJECTION SYSTEM: UTM Zone 16
COORDINATE SYSTEM: WGS84
Print Date: 9/18/2016
*GPS coordinates are approximate

Appendix II:

Remote Telemetering Air Monitoring Graphs

Remote Telemetering Real-time Air Monitoring | LEL

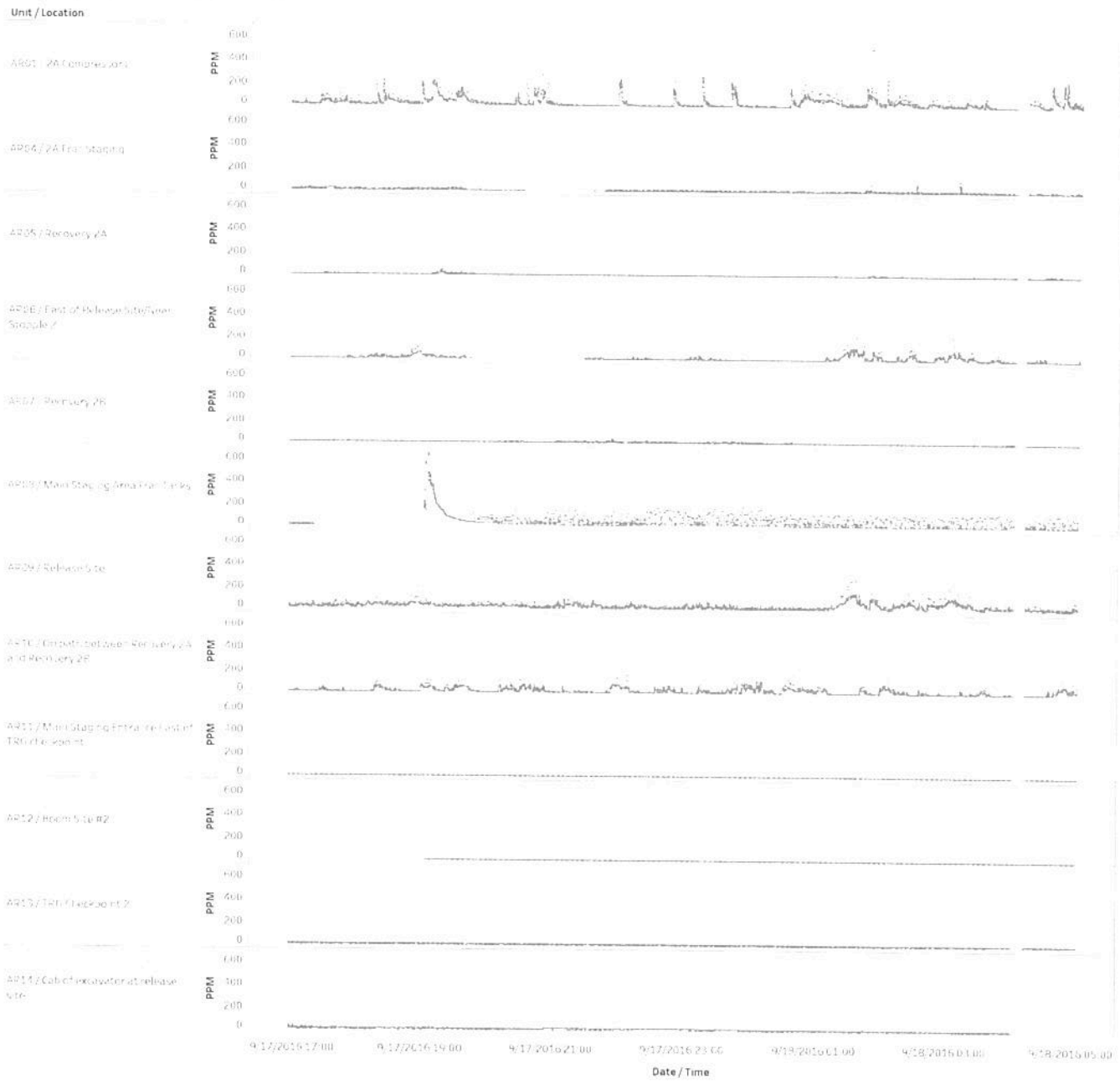
CR-91 Event | 9/17/2016 17:01 to 9/18/2016 04:59



LEL readings are a true representation of atmospheric conditions (appropriate correction factors have been applied to field values).

Remote Telemetering Real-time Air Monitoring | VOC

CR-91 Event | 9/17/2016 17:01 to 9/18/2016 04:59



VOC readings are a true representation of all ambient conditions (appropriate correction factors have been applied to field values).

Remote Telemetering Real-time Air Monitoring | Oxygen

CR-91 Event | 9/17/2016 17:01 to 9/18/2016 01:59

CR-91 Event – Shelby County, AL
Preliminary Air Monitoring Summary
September 18, 2016 17:00

Prepared by
Center for Toxicology and Environmental Health, L.L.C. (CTEH®)
On Behalf of Colonial Pipeline

CTEH CENTER FOR TOXICOLOGY AND ENVIRONMENTAL HEALTH, LLC

Introduction

On September 9, 2016, the Center for Toxicology and Environmental Health, L.L.C. (CTEH®) initiated air monitoring in support of response efforts to the gasoline release in Shelby County, AL. This report presents the real-time air monitoring data recorded from September 18 2016 05:00 to September 18, 2016 17:00 CDT.

Real-Time Air Monitoring[1]

Real-time air monitoring was conducted to evaluate the potential airborne presence of gasoline-associated constituents, if any, during response operations. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as total volatile organic compounds (VOCs), oxygen, benzene, and flammability as the percent of the lower explosive limit (LEL) using remote telemetering RAESystems® AreaRAEs, hand-held instruments such as RAESystems® MultiRAE Pro/Plus' and UltraRAEs, as well as Gastec® colorimetric detection tubes.

During this monitoring period, eight benzene, five LEL and nine VOC action level exceedances were recorded during worker activity monitoring, including instantaneous VOC and benzene readings which were recorded above the action level. When necessary, workers egressed the area in accordance with the approved sampling and analysis plan.

Table 1, below, presents the results of real-time air monitoring using hand-held instruments. Maps of the incident site location and locations of hand-held real-time air monitoring readings are provided in **Appendix I**.

[1] *Real-time air monitoring refers to the use of hand-held instruments that provide near-instantaneous readings of an airborne chemical concentration without the need for laboratory analysis.*

Table 1: Hand-Held Real-Time Air Monitoring Summary[1]
September 18, 2016 05:00 to September 18, 2016 17:00

Location Category	Analyte	Instrument	Count of Readings	Count of Detections	Range of Detections[2,3]
Worker Activity Monitoring	Benzene	UltraRAE	108	18	0.05 - 300 ppm
	Gasoline	Gastec #101L	3	0	<5 ppm
	Hexane	Gastec #102L	3	0	<1 ppm
	%LEL	MultiRAE Plus	33	0	<1 %
		MultiRAE Pro	183	5	4 - 20 %
	Toluene	Gastec #122	2	0	<1 ppm
		Gastec #122L	2	0	<0.5 ppm
	VOCs	MultiRAE Plus	37	13	0.1 - 17.1 ppm
		MultiRAE Pro	183	51	0.1 - 1900 ppm
	Xylene	Gastec #123	2	0	<1 ppm
Community	LEL	MultiRAE Pro	2	0	<1 %
	VOC	MultiRAE Pro	2	0	<0.1 ppm
Site Characterization	Benzene	UltraRAE	5	2	5 - 100 ppm
	%LEL	MultiRAE Pro	5	2	11 - 56 %
	VOC	MultiRAE Pro	6	5	6.5 - 1250 ppm

[1]Please Note: The data displayed in the above table has not undergone complete QC analysis and is presented in a preliminary format.
[2]Maximum detections preceded by the "<" symbol are considered non-detections below the instrument limit of detection (LoD) value to the right.
[3]Numbers are the raw values, no correction factors have been applied.

During this monitoring period remote telemetering equipment recorded 5060 detections of VOCs above the CTEH established action level of 30 ppm and 14 detections of LEL above the CTEH established action level of 10% (3% as raw values on LEL sensors).

Table 2 (below) summarizes remote telemetering AreaRAE data for this monitoring period. For this reporting period AreaRAE monitoring data may contain drift events[2]. **Appendix I** and **Appendix II** include location maps and graphs for remote telemetering data, respectively. [4]

[2] Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.

Table 2: Remote Telemetering Real-time Air Monitoring Summary[1,3]

September 18, 2016 05:00 to September 18, 2016 17:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections[2]
AR01	2A Compressors	LEL	5258	95	1.2 - 5 %
		O_2	5258	5258	20.9 - 21.6 %
		VOC	5258	4691	0.1 - 423.8 ppm
AR04	2A Frac Tank Staging	LEL	8133	0	<1 %
		O_2	8133	8133	20.9 - 20.9 %
		VOC	8133	5171	0.1 - 57.6 ppm
AR05	2A Recovery	LEL	6301	0	<1 %
		O_2	6301	6301	20.9 - 20.9 %
		VOC	6301	2491	0.1 - 45.1 ppm
AR06	East of Release Site/Near Stopple 2	LEL	8290	0	<1 %
		O_2	8290	8290	20.9 - 21.9 %
		VOC	8290	2655	0.1 - 46 ppm
AR07	2B Recovery	LEL	8070	0	<1 %
		O_2	8070	8070	20.9 - 20.9 %
		VOC	8070	4976	0.1 - 78.6 ppm
AR08	Main Staging Area Frac Tanks	LEL	8119	0	<1 %
		O_2	8119	8119	20.5 - 21.3 %
		VOC	8119	5755	0.1 - 35.6 ppm
AR09	Release Site	LEL	8354	0	<1 %
		O_2	8354	8354	20.7 - 20.9 %
		VOC	8354	4560	0.1 - 118.1 ppm
AR10	On path between Recovery 2A and Recovery 2B.	LEL	8133	0	<1 %
		O_2	8133	8133	20.4 - 20.9 %
		VOC	8133	6428	0.1 - 157.2 ppm
AR11	Main Staging Entrance East of TRG checkpoint	LEL	6485	0	<1 %
		O_2	6485	6485	20.9 - 20.9 %
		VOC	6485	0	<0.1 ppm
AR12	Boom Site #2	LEL	2740	0	<1 %
		VOC	2740	27	0.1 - 0.1 ppm
AR13	TRG Checkpoint 2 - access to stopple 1, Recovery 2A and 2A Frac Tank Staging Area.	LEL	8100	0	<1 %
		O_2	8100	8100	20.9 - 21.3 %
		VOC	8100	4109	0.1 - 0.9 ppm
AR14	Cab of excavator at release site	LEL	4054	0	<1 %
		O_2	4054	4054	20.9 - 20.9 %
		VOC	4054	99	0.1 - 5.6 ppm

[1]*Please note: The data displayed here has not undergone complete QA/QC analysis and is presented in a preliminary format.*

[2]*Maximum detections preceded by the "<" symbol are considered at the limit of detection (LoD) value to the right.*

[3]*LEL and VOC values are raw values, correction factors have not been applied.*

Appendix I:

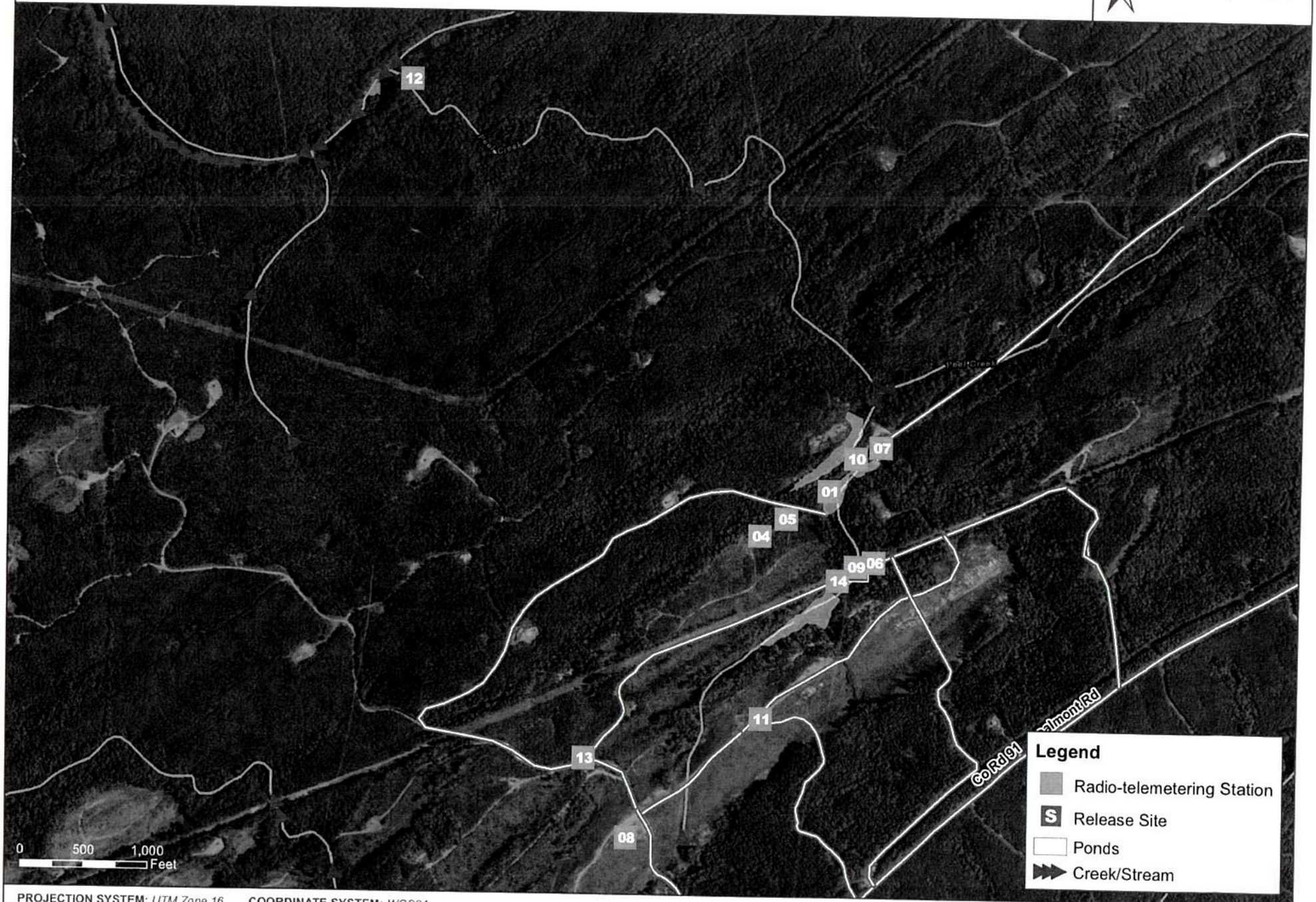
Site Location, Hand-Held Real-Time Air Monitoring Location, and Remote Telemetering Air Monitoring Location Maps

Radio-telemetering Real-time Air Monitoring Station Locations

CR-91 Event 9/18/2016

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, LA



PROJECTION SYSTEM: *UTM Zone 16* COORDINATE SYSTEM: *WGS84*

Print Date: *9/18/2016*

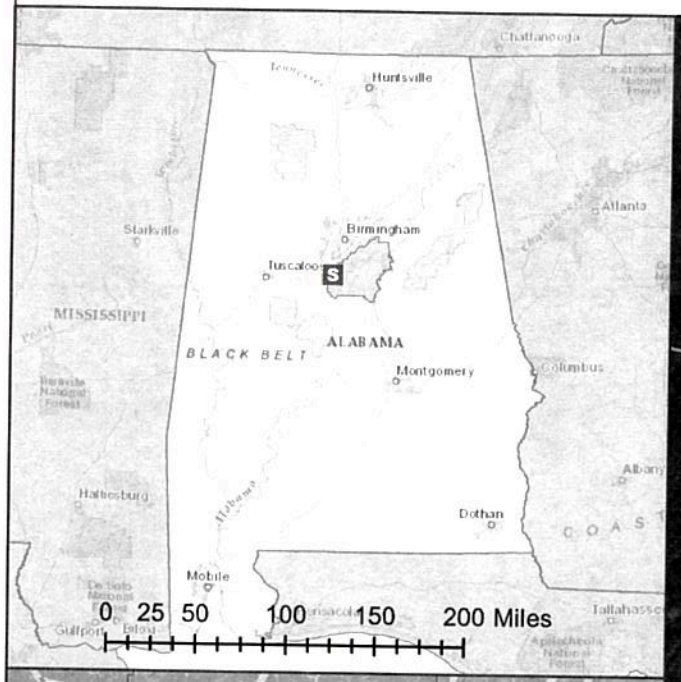
CTEH

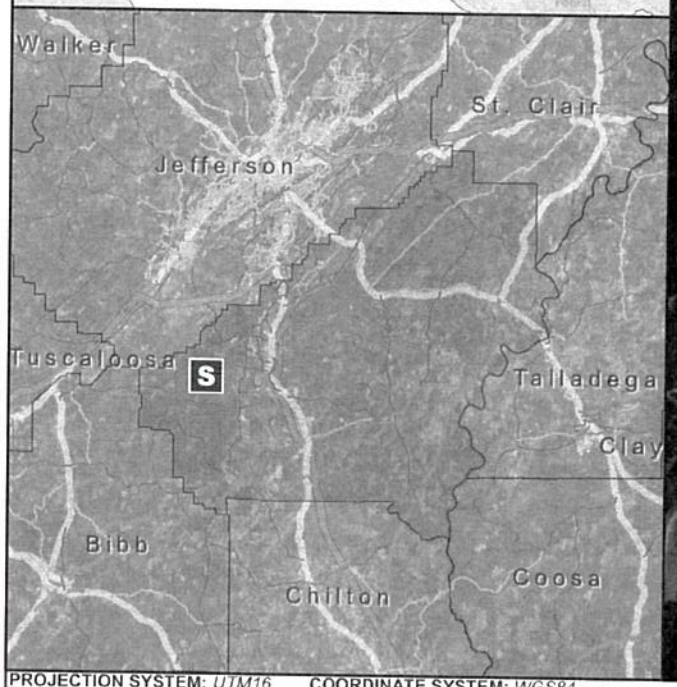
CR-91 Event

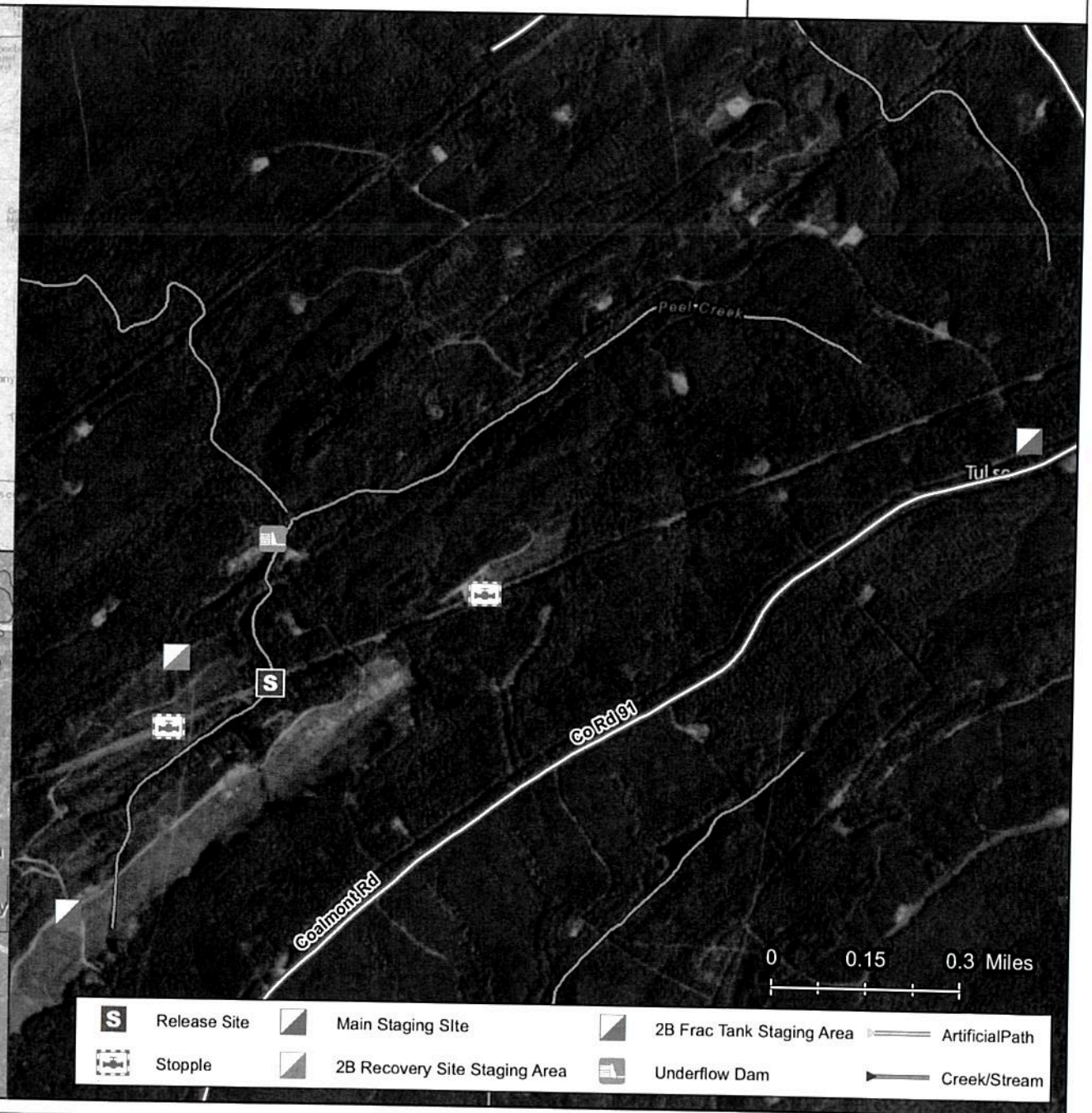
Site Location

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL







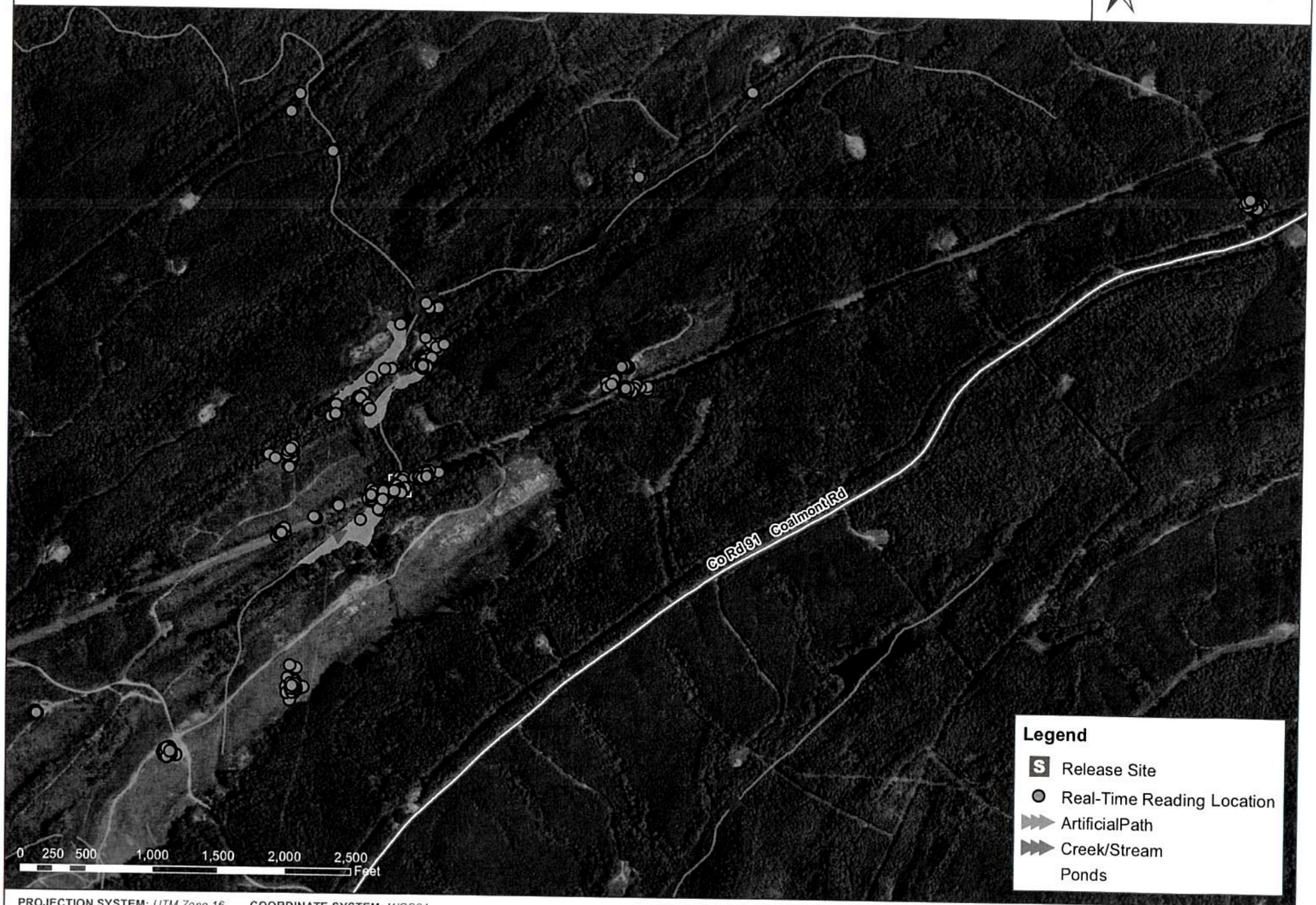
PROJECTION SYSTEM: *UTM16* COORDINATE SYSTEM: *WGS84*

Print Date: *9/13/2016*

Manually-Logged Real-Time Reading Locations

CR-91 Event | 09/18/2016 05:00 – 09/18/2016 17:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

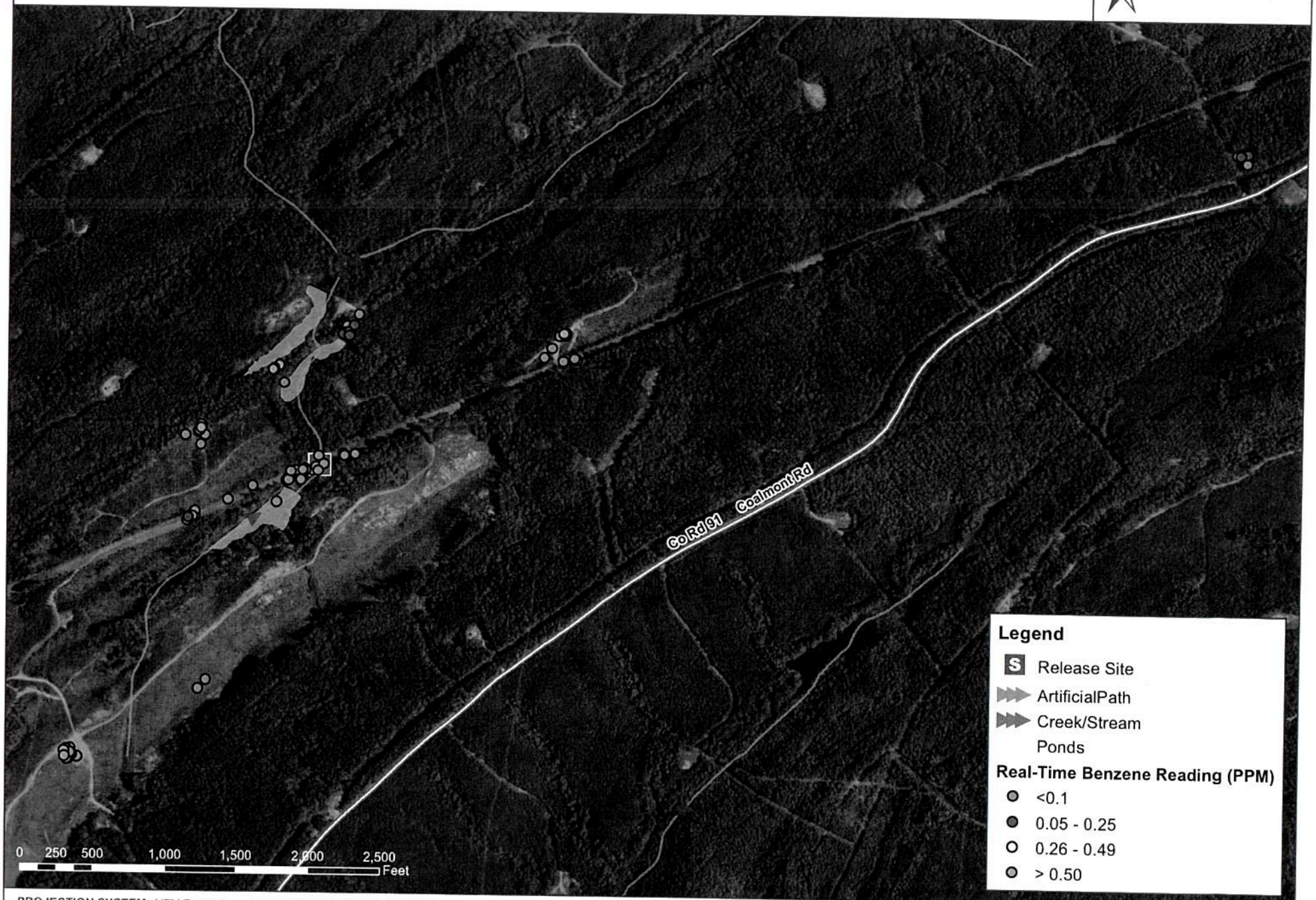
Print Date: *9/18/2016*

**GPS coordinates are approximate*

Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/18/2016 05:00 – 09/18/2016 17:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

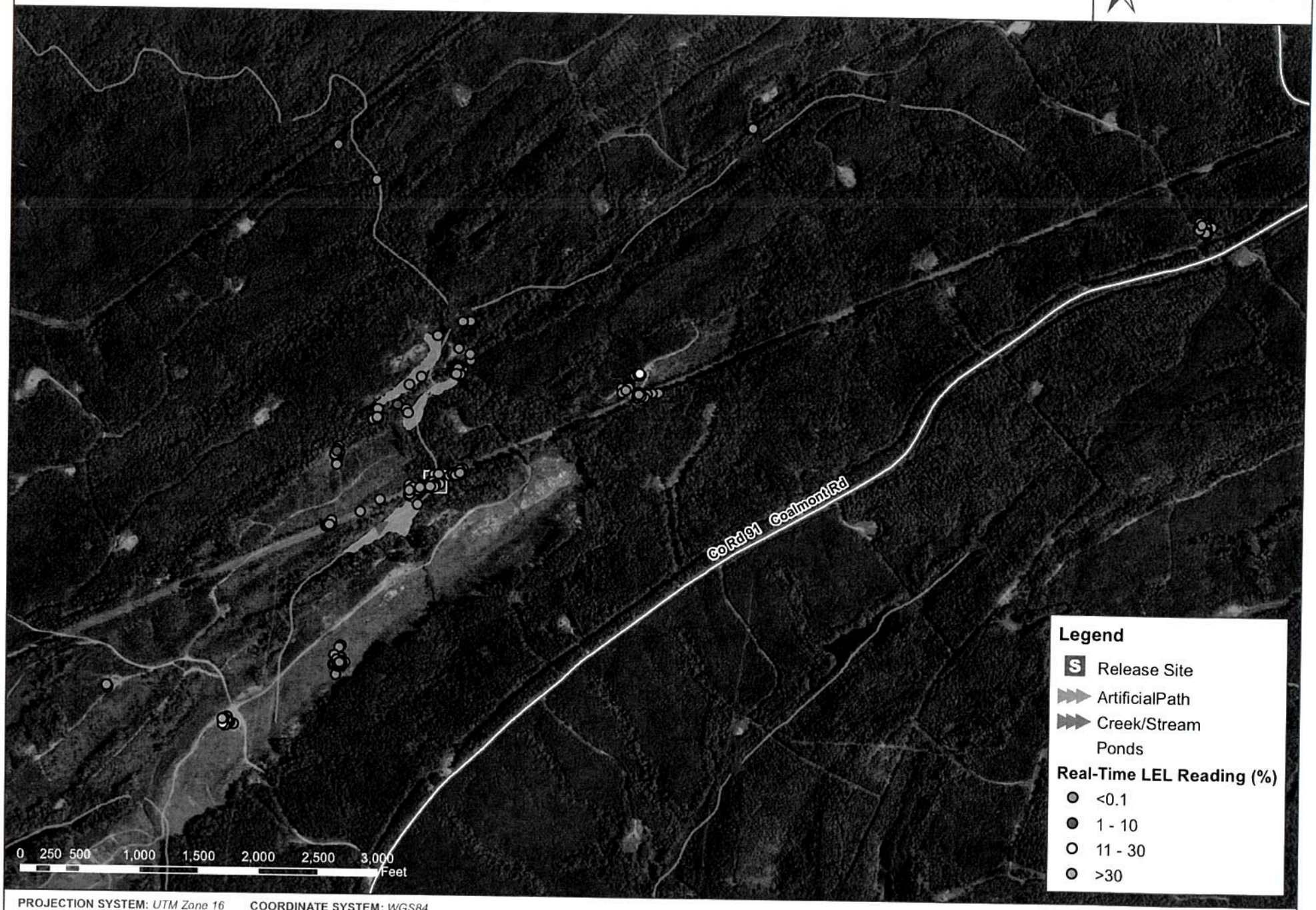
Print Date: *9/18/2016*

**GPS coordinates are approximate*

Manually-Logged Real-Time Readings | LEL

CR-91 Event | 09/18/2016 05:00 – 09/18/2016 17:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

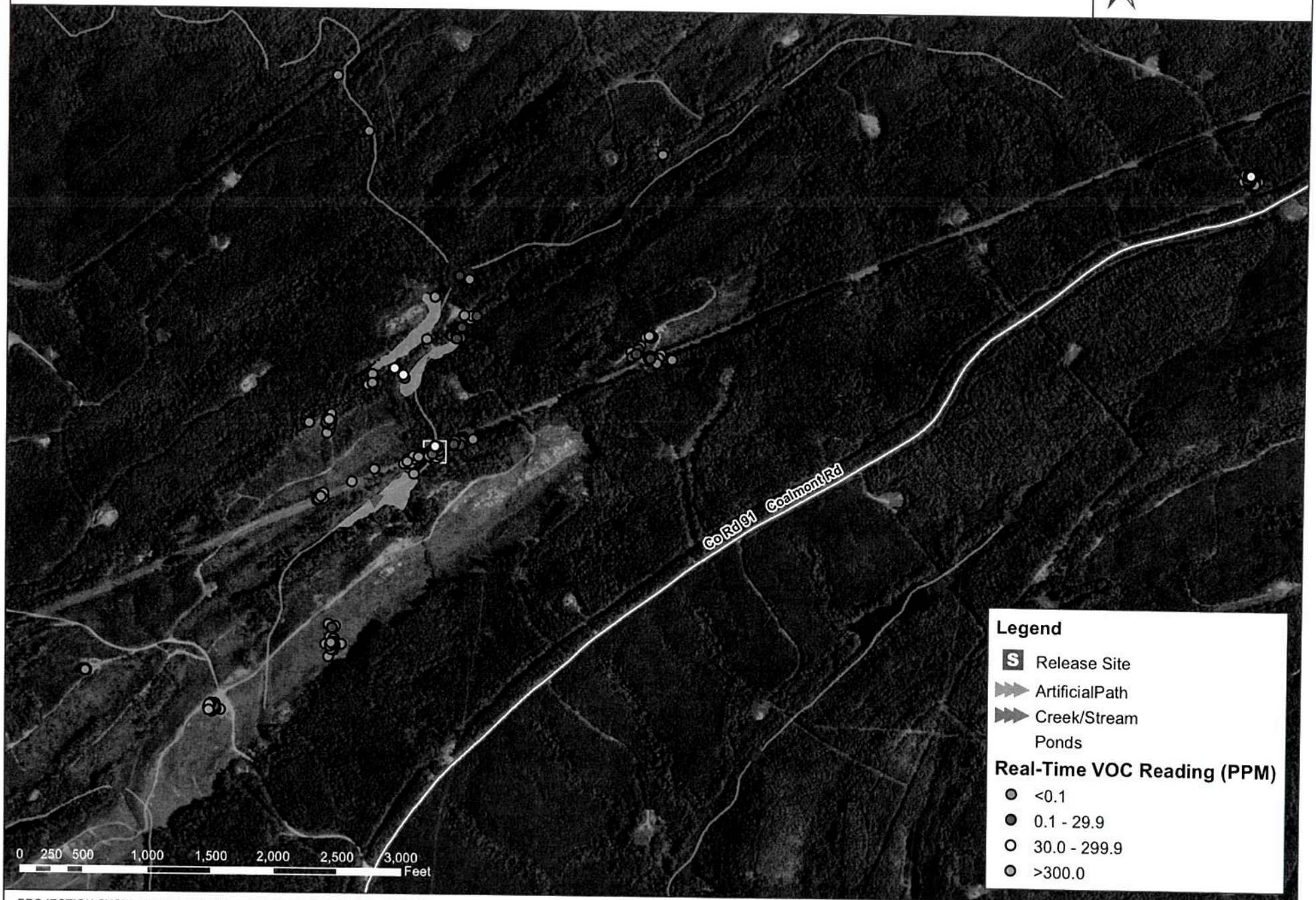
Print Date: *9/18/2016*

**GPS coordinates are approximate*

Manually-Logged Real-Time Readings | VOC

CR-91 Event | 09/18/2016 05:00 – 09/18/2016 17:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

Print Date: *9/18/2016*

**GPS coordinates are approximate*

Appendix II:

Remote Telemetering Air Monitoring Graphs

Remote Telemetering Real-time Air Monitoring | VOC

CR-91 Event | 9/18/2016 05:00 to 9/18/2016 16:59

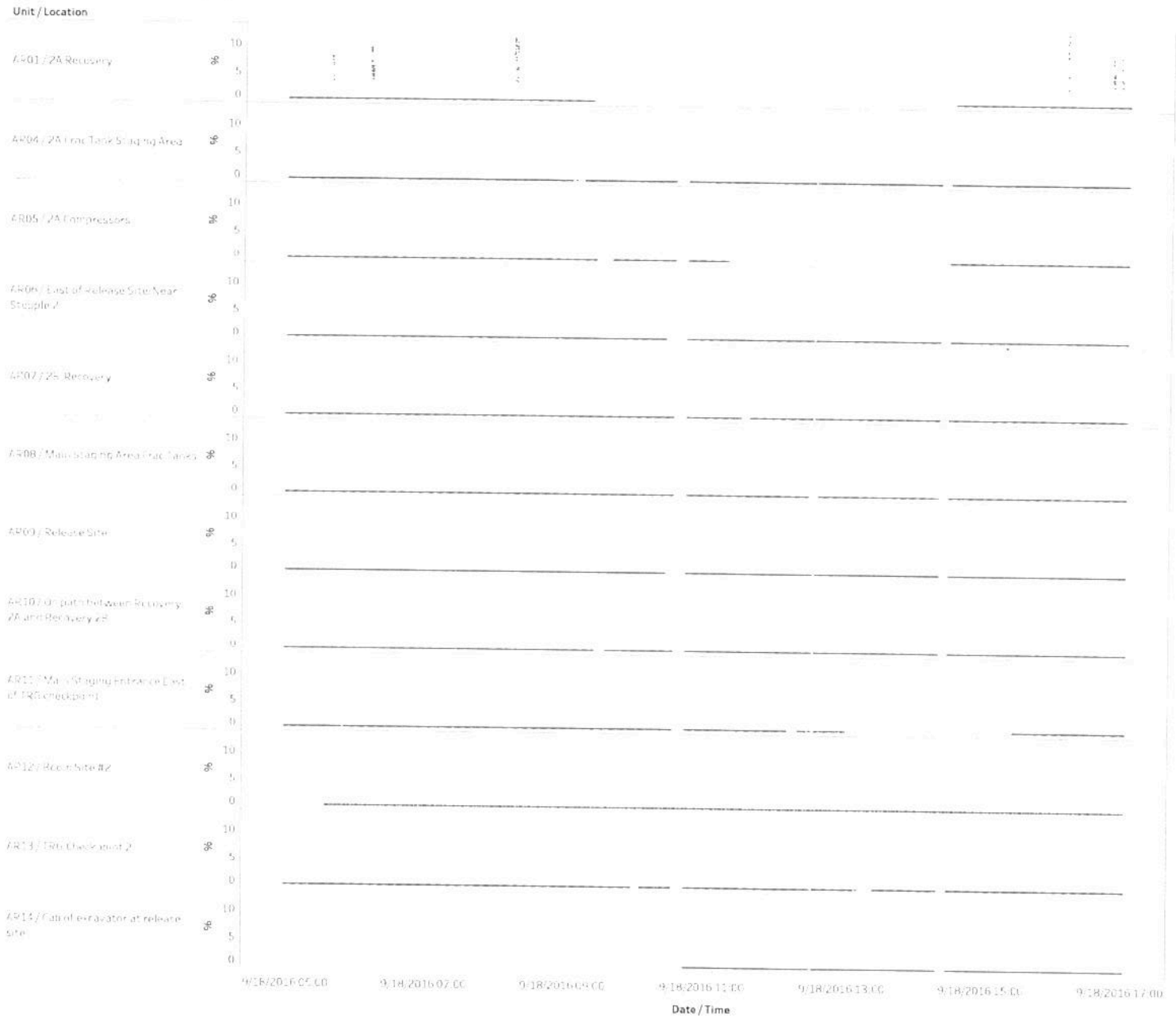
VOC readings are a true representation of atmospheric conditions (appropriate correction factors have been applied to field values).

Remote Telemetering Real-time Air Monitoring | Oxygen

CR-91 Event | 9/18/2016 05:00 to 9/18/2016 16:59

Remote Telemetering Real-time Air Monitoring | LEL

CR-91 Event | 9/18/2016 05:00 to 9/18/2016 16:59



LEL readings are a true representation of atmospheric conditions (appropriate correct on factors have been applied to field values).

CR-91 Event – Shelby County, AL
Preliminary Air Monitoring Summary
September 19, 2016 05:00

Prepared by
Center for Toxicology and Environmental Health, L.L.C. (CTEH®)
On Behalf of Colonial Pipeline

CTEH CENTER FOR TOXICOLOGY AND ENVIRONMENTAL HEALTH, LLC

Introduction

On September 9, 2016, the Center for Toxicology and Environmental Health, L.L.C. (CTEH®) initiated air monitoring in support of response efforts to the gasoline release in Shelby County, AL. This report presents the real-time air monitoring data recorded from September 18 2016 17:00 to September 19, 2016 05:00 CDT.

Real-Time Air Monitoring[1]

Real-time air monitoring was conducted to evaluate the potential airborne presence of gasoline-associated constituents, if any, during response operations. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as total volatile organic compounds (VOCs), oxygen, benzene, and flammability as the percent of the lower explosive limit (LEL) using remote telemetering RAESystems® AreaRAEs, hand-held instruments such as RAESystems® MultiRAE Pro/Plus' and UltraRAEs, as well as Gastec® colorimetric detection tubes.

During this monitoring period, four benzene, one LEL and 13 VOC action level exceedances were recorded during worker activity monitoring, including instantaneous VOC and benzene readings which were recorded above the action level. When necessary, workers egressed the area in accordance with the approved sampling and analysis plan.

Table 1, below, presents the results of real-time air monitoring using hand-held instruments. Maps of the incident site location and locations of hand-held real-time air monitoring readings are provided in **Appendix I**.

[1] *Real-time air monitoring refers to the use of hand-held instruments that provide near-instantaneous readings of an airborne chemical concentration without the need for laboratory analysis.*

Table 1: Hand-Held Real-Time Air Monitoring Summary[1]
September 18, 2016 17:00 to September 19, 2016 05:00

Location Category	Analyte	Instrument	Count of Readings	Count of Detections	Range of Detections[2,3]
Worker Activity Monitoring	Benzene	UltraRAE	76	32	0.05 - 6.6 ppm
	%LEL	MultiRAE Plus	27	0	<1 %
		MultiRAE Pro	163	1	7 - 7 %
	VOCs	MultiRAE Plus	26	11	0.4 - 12.8 ppm
		MultiRAE Pro	176	118	0.1 - 440 ppm
	Xylene	Gastec #123	1	0	<1 ppm
Site Characterization	Benzene	UltraRAE	4	2	6 - 160 ppm
	%LEL	MultiRAE Pro	6	2	4 - 8 %
	VOC	MultiRAE Pro	6	6	0.9 - 4999.9 ppm4

[1]Please Note: The data displayed in the above table has not undergone complete QC analysis and is presented in a preliminary format.
[2]Maximum detections preceded by the "<" symbol are considered non-detections below the instrument limit of detection (LoD) value to the right.
[3]Numbers are the raw values, no correction factors have been applied.
[4]VOC sensor upper detection limit for the MultiRAE Pro is 5000 ppm.

During this monitoring period remote telemetering equipment recorded 2235 detections of VOCs above the CTEH established action level of 30 ppm and 3 detections of LEL above the CTEH established action level of 10% (3% as raw values on LEL sensors).

Table 2 (below) summarizes remote telemetering AreaRAE data for this monitoring period. For this reporting period AreaRAE monitoring data may contain drift events[2]. **Appendix I** and **Appendix II** include location maps and graphs for remote telemetering data, respectively. [4]

[2] Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.

Table 2: Remote Telemetering Real-time Air Monitoring Summary[1,3]

September 18, 2016 17:00 to September 19, 2016 05:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections[2]
AR01	2A Compressors	LEL	2761	22	1.1 - 4 %
		O_2	2761	2761	20.9 - 20.9 %
		VOC	2761	2672	0.1 - 302.1 ppm
AR04	2A Frac Tank Staging	LEL	2761	0	<1 %
		O_2	2761	2761	20.9 - 21.3 %
		VOC	2761	2581	0.1 - 70.9 ppm
AR05	2A Recovery	LEL	2743	0	<1 %
		O_2	2743	2743	20.9 - 20.9 %
		VOC	2743	2681	0.1 - 63.7 ppm
AR06	East of Release Site/Near Stopple 2	LEL	2814	0	<1 %
		O_2	2814	2814	20.9 - 22 %
		VOC	2814	2631	0.1 - 87 ppm
AR07	2B Recovery	LEL	2827	0	<1 %
		O_2	2827	2827	20.9 - 20.9 %
		VOC	2827	2336	0.1 - 23.4 ppm
AR08	Main Staging Area Frac Tanks	LEL	2747	0	<1 %
		O_2	2747	2747	20.9 - 21.3 %
		VOC	2747	2024	0.1 - 44.2 ppm
AR09	Release Site	LEL	2740	12	1.2 - 4.9 %
		O_2	2740	2740	20.5 - 20.9 %
		VOC	2740	1906	0.1 - 107.9 ppm
AR10	On path between Recovery 2A and Recovery 2B.	LEL	2784	0	<1 %
		O_2	2784	2784	20.9 - 21.2 %
		VOC	2784	2760	0.1 - 99.9 ppm
AR11	Main Staging Entrance East of TRG checkpoint	LEL	2726	0	<1 %
		O_2	2726	2726	20.9 - 20.9 %
		VOC	2726	973	0.1 - 18.4 ppm
AR12	Boom Site #2	LEL	2503	0	<1 %
		VOC	2503	301	0.1 - 1.5 ppm
AR13	TRG Checkpoint 2 - access to stopple 1, Recovery 2A and 2A Frac Tank Staging Area.	LEL	2684	0	<1 %
		O_2	2684	2684	20.9 - 20.9 %
		VOC	2684	1114	0.1 - 13.1 ppm
AR14	Cab of excavator at release site	LEL	2739	0	<1 %
		O_2	2739	2739	20.9 - 20.9 %
		VOC	2739	2607	0.1 - 55.5 ppm

[1]*Please note: The data displayed here has not undergone complete QA/QC analysis and is presented in a preliminary format.*

[2]*Maximum detections preceded by the "<" symbol are considered at the limit of detection (LoD) value to the right.*

[3]*LEL and VOC values are raw values, correction factors have not been applied.*

Appendix I:

Site Location, Hand-Held Real-Time Air Monitoring Location, and Remote Telemetering Air Monitoring Location Maps

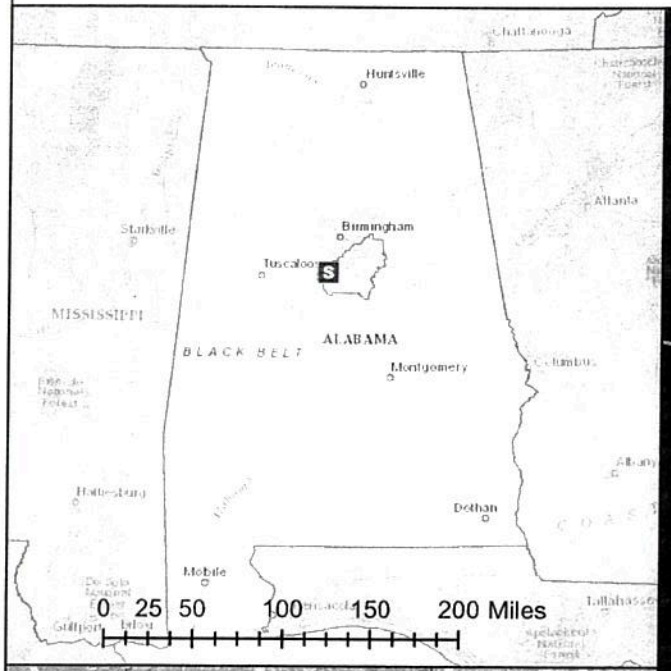
CTEH

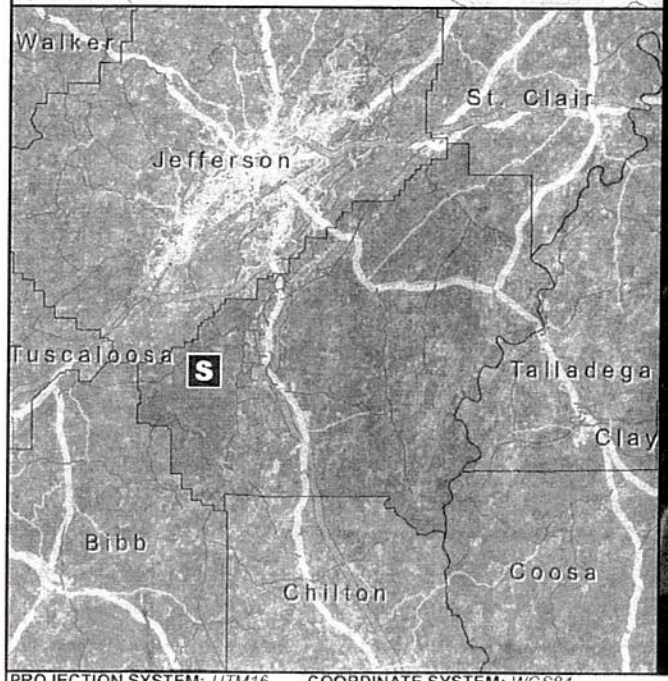
CR-91 Event

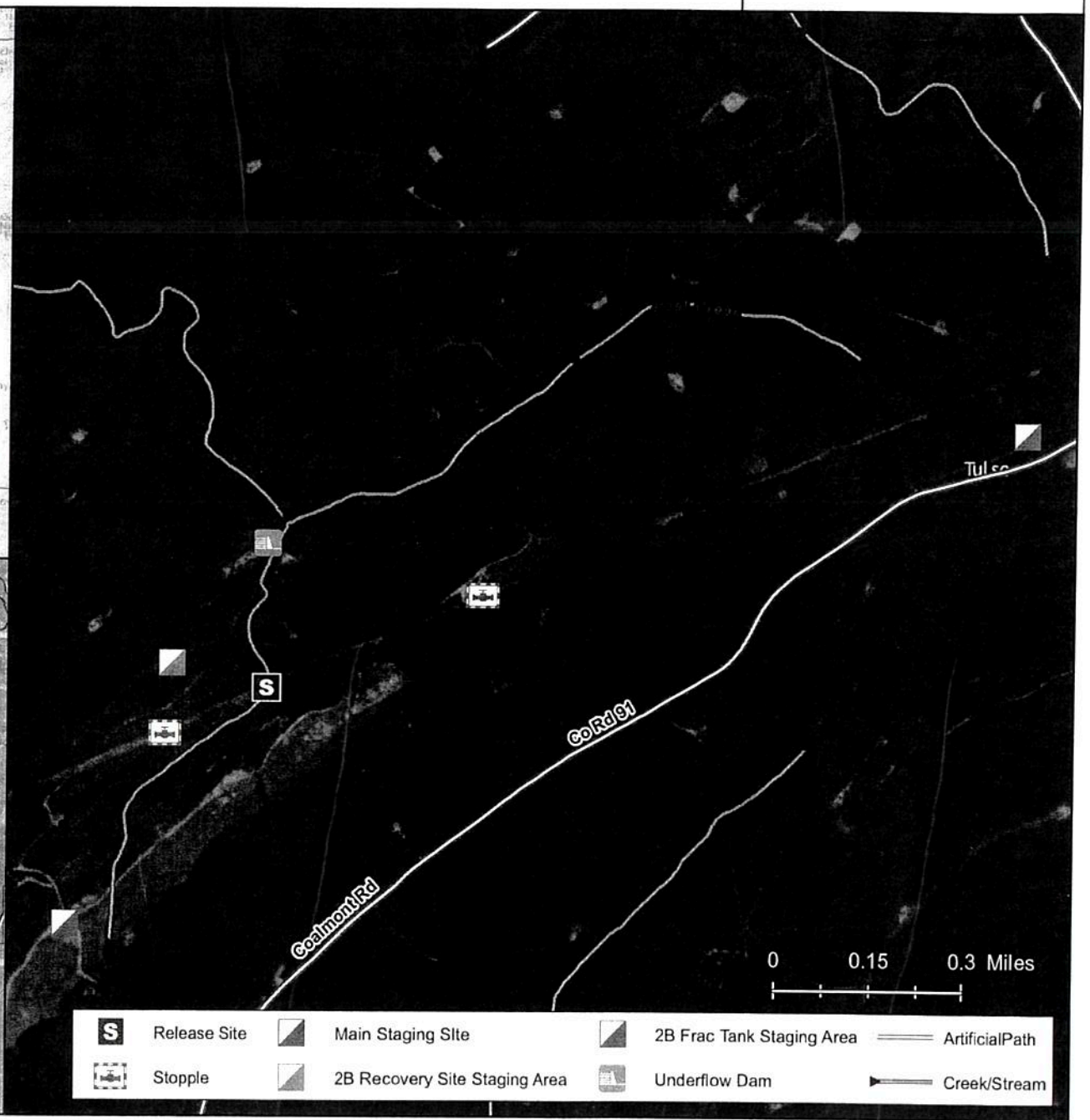
Site Location

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL







PROJECTION SYSTEM: *UTM16* COORDINATE SYSTEM: *WGS84*

Print Date: *9/13/2016*

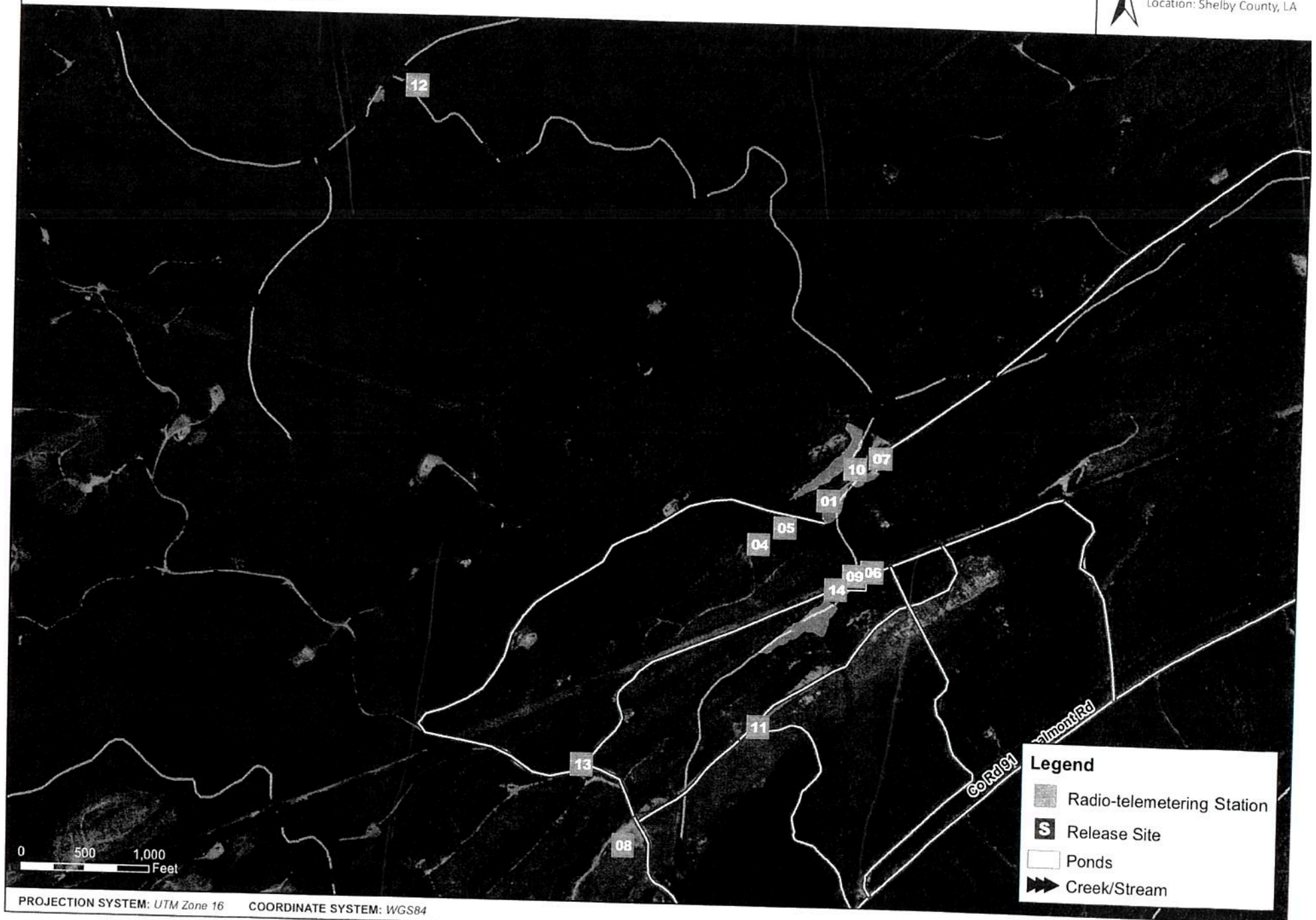
CTEH

Radio-telemetering Real-time Air Monitoring Station Locations

CR-91 Event 9/18/2016

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, LA



PROJECTION SYSTEM: *UTM Zone 16* COORDINATE SYSTEM: *WGS84*

Print Date: *9/18/2016*

Appendix II:

Remote Telemetering Air Monitoring Graphs

CTEH

Manually-Logged Real-Time Reading Locations

CR-91 Event | 09/18/2016 17:00 – 09/19/2016 05:00

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL

PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

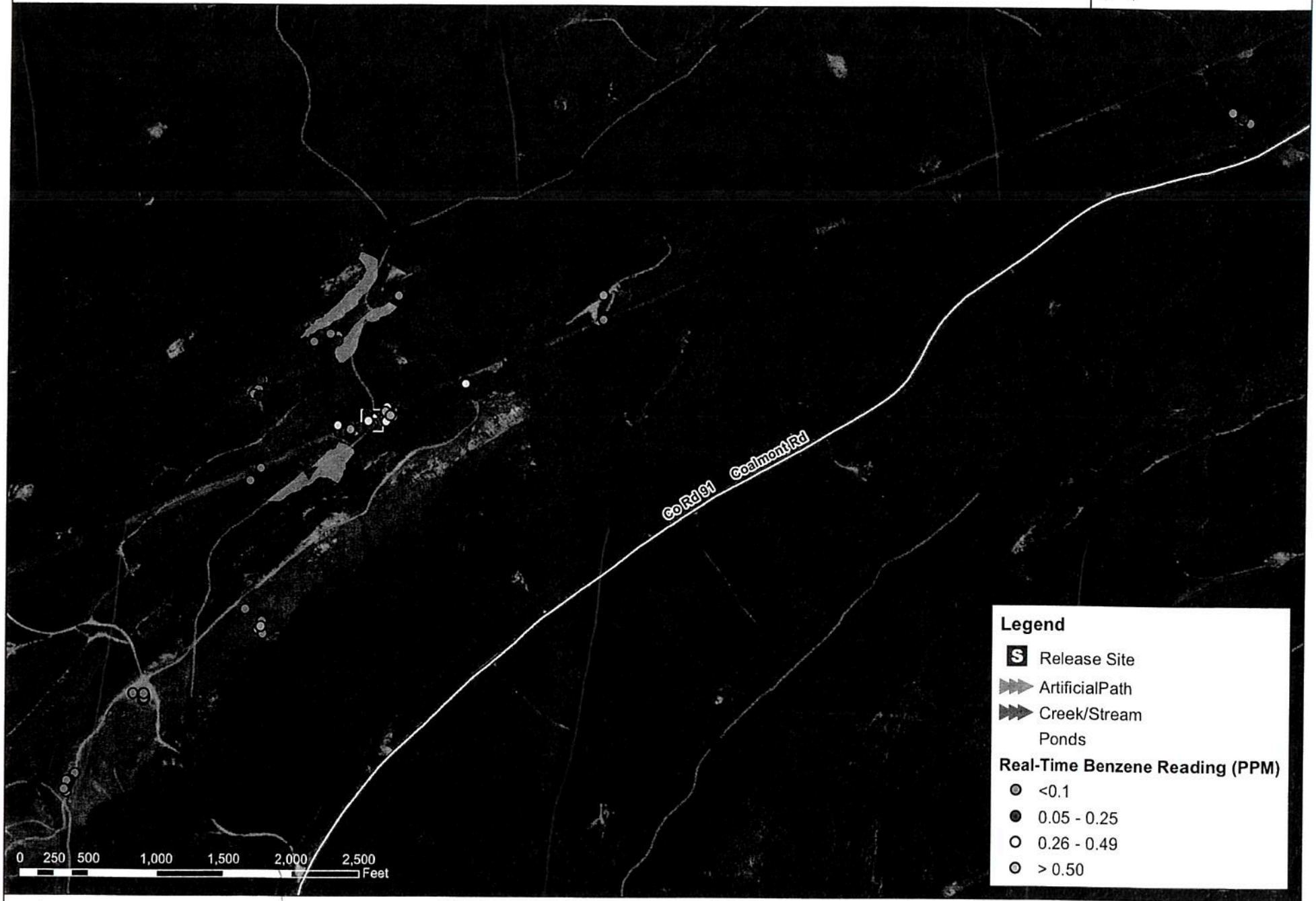
*GPS coordinates are approximate

Print Date: *9/19/2016*

Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/18/2016 17:00 – 09/19/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

Print Date: *9/19/2016*

**GPS coordinates are approximate*

CTEH

Manually-Logged Real-Time Readings | LEL

CR-91 Event | 09/18/2016 17:00 – 09/19/2016 05:00

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL

PROJECTION SYSTEM: *UTM Zone 16* COORDINATE SYSTEM: *WGS84*

*GPS coordinates are approximate

Print Date: *9/19/2016*

Manually-Logged Real-Time Readings | VOC

CR-91 Event | 09/18/2016 17:00 – 09/19/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL

PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

Print Date: *9/19/2016*

**GPS coordinates are approximate*

CR-91 Event – Shelby County, AL
Preliminary Air Monitoring Summary
September 20, 2016 05:00

Prepared by
Center for Toxicology and Environmental Health, L.L.C. (CTEH®)
On Behalf of Colonial Pipeline

CTEH CENTER FOR TOXICOLOGY AND ENVIRONMENTAL HEALTH, LLC

Introduction

On September 9, 2016, the Center for Toxicology and Environmental Health, L.L.C. (CTEH®) initiated air monitoring in support of response efforts to the gasoline release in Shelby County, AL. This report presents the real-time air monitoring data recorded from September 19 2016 05:00 to September 20, 2016 05:00 CDT.

Real-Time Air Monitoring[1]

Real-time air monitoring was conducted to evaluate the potential airborne presence of gasoline-associated constituents, if any, during response operations. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as total volatile organic compounds (VOCs), oxygen, benzene, gasoline, hexane, naphthalene, xylene, and flammability as the percent of the lower explosive limit (LEL) using remote telemetering RAESystems® AreaRAEs, hand-held instruments such as RAESystems® MultiRAE Pro/Plus' and UltraRAEs, as well as Gastec® colorimetric detection tubes.

During this monitoring period, six benzene, two LEL, and 15 VOC detections were recorded above the action level concentration during worker activity monitoring. During those instances when detections were sustained, workers were either wearing respiratory protection, or egressed the area in accordance with the approved sampling and analysis plan.

Table 1, below, presents the results of real-time air monitoring using hand-held instruments. Maps of the incident site location and locations of hand-held real-time air monitoring readings are provided in **Appendix I**.

[1] Real-time air monitoring refers to the use of hand-held instruments that provide near-instantaneous readings of an airborne chemical concentration without the need for laboratory analysis.

Table 1: Hand-Held Real-Time Air Monitoring Summary[1]

September 19, 2016 05:00 to September 20, 2016 05:00

Location Category	Analyte	Instrument	Count of Readings	Count of Detections	Range of Detections[2,3]
Worker Activity Monitoring	Benzene	UltraRAE	160	23	0.05 - 4.1 ppm
	Gasoline	Gastec #101L	10	0	<5 ppm
	Hexane	Gastec #102L	8	0	<1 ppm
	%LEL	MultiRAE Plus	147	0	<1 %
		MultiRAE Pro	267	2	4 - 9 %
	Naphthalene	Gastec #60	2	0	<0.1 ppm
	Toluene	Gastec #122	8	0	<1 ppm
		Gastec #122L	1	0	<0.5 ppm
	VOCs	MultiRAE Plus	133	16	0.1 - 31.4 ppm
		MultiRAE Pro	306	126	0.02 - 700 ppm
	Xylene	Gastec #123	9	0	<1 ppm

[1]Please Note: The data displayed in the above table has not undergone complete QC analysis and is presented in a preliminary format.

[2]Maximum detections preceded by the "<" symbol are considered non-detections below the instrument limit of detection (LoD) value to the right.

[3]Numbers are the raw values, no correction factors have been applied.

In addition to worker activity monitoring, remote telemetering equipment established as an early warning system recorded 14 detections of VOCs above the site-specific action level of 300 ppm and 3 detections of LEL above the LEL action level of 10% (3% as raw values on LEL sensors). **Table 2** (below) summarizes remote telemetering AreaRAE data for this monitoring period, which may contain drift events[2]. **Appendix I** and **Appendix II** include location maps and graphs for remote telemetering data, respectively.

[2] Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.

Table 2: Remote Telemetering Real-time Air Monitoring Summary[1,3]

September 19, 2016 05:00 to September 20, 2016 05:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections[2]
AR01	2A Recovery	LEL	4531	10	1.1 - 3.4 %
		O_2	1836	1836	20.9 - 21.2 %
		VOC	4531	4002	0.1 - 701.2 ppm
AR04	2A Frac Tank Staging	LEL	5179	0	<1 %
		O_2	1306	1306	20.9 - 20.9 %
		VOC	5179	2410	0.1 - 45.4 ppm
AR05	2A Compressors	LEL	2282	0	<1 %
		O_2	1356	1356	20.9 - 20.9 %
		VOC	2282	1627	0.1 - 141.4 ppm
AR06	East of Release Site/Near Stopple 2	LEL	5325	0	<1 %
		O_2	757	757	20.9 - 21.1 %
		VOC	5325	3694	0.1 - 189.3 ppm
AR07	2B Recovery	LEL	5094	0	<1 %
		O_2	1634	1634	20.9 - 20.9 %
		VOC	5094	3946	0.1 - 88.1 ppm
AR08	Main Staging Area Frac Tanks	LEL	5185	0	<1 %
		O_2	867	867	20.9 - 20.9 %
		VOC	5185	2063	0.1 - 13.1 ppm
AR09	Release Site	LEL	3669	0	<1 %
		O_2	3669	3669	20.4 - 20.9 %
		VOC	3669	2838	0.1 - 402 ppm
AR10	On path between Recovery 2A and Recovery 2B.	LEL	4329	0	<1 %
		O_2	1365	1365	20.9 - 20.9 %
		VOC	4329	2941	0.1 - 100.5 ppm
AR11	Main Staging Entrance East of TRG checkpoint	LEL	5131	0	<1 %
		O_2	1176	1176	20.9 - 20.9 %
		VOC	5131	1503	0.1 - 12.7 ppm
AR12	Boom Site #2	LEL	5758	0	<1 %
		O_2	2902	2902	20.9 - 21.4 %
		VOC	5758	1235	0.1 - 1.8 ppm
AR13	TRG Checkpoint 2 - access to stopple 1, Recovery 2A and 2A Frac Tank Staging Area.	LEL	5116	0	<1 %
		O_2	1250	1250	20.5 - 20.9 %
		VOC	5116	1547	0.1 - 12.2 ppm
AR14	Cab of excavator at release site	LEL	4801	0	<1 %
		O_2	844	844	20.9 - 20.9 %
		VOC	4801	2411	0.1 - 31.7 ppm

[1]Please note: The data displayed here has not undergone complete QA/QC analysis and is presented in a preliminary format.

[2]Maximum detections preceded by the "<" symbol are considered at the limit of detection (LoD) value to the right.

[3]LEL and VOC values are raw values, correction factors have not been applied.

Appendix I:

Site Location, Hand-Held Real-Time Air Monitoring Location, and Remote Telemetering Air Monitoring Location Maps

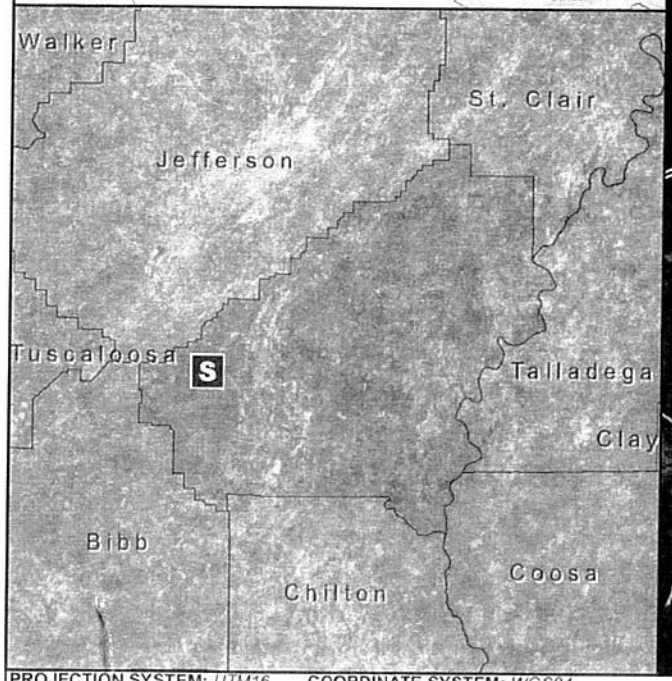
CTEH

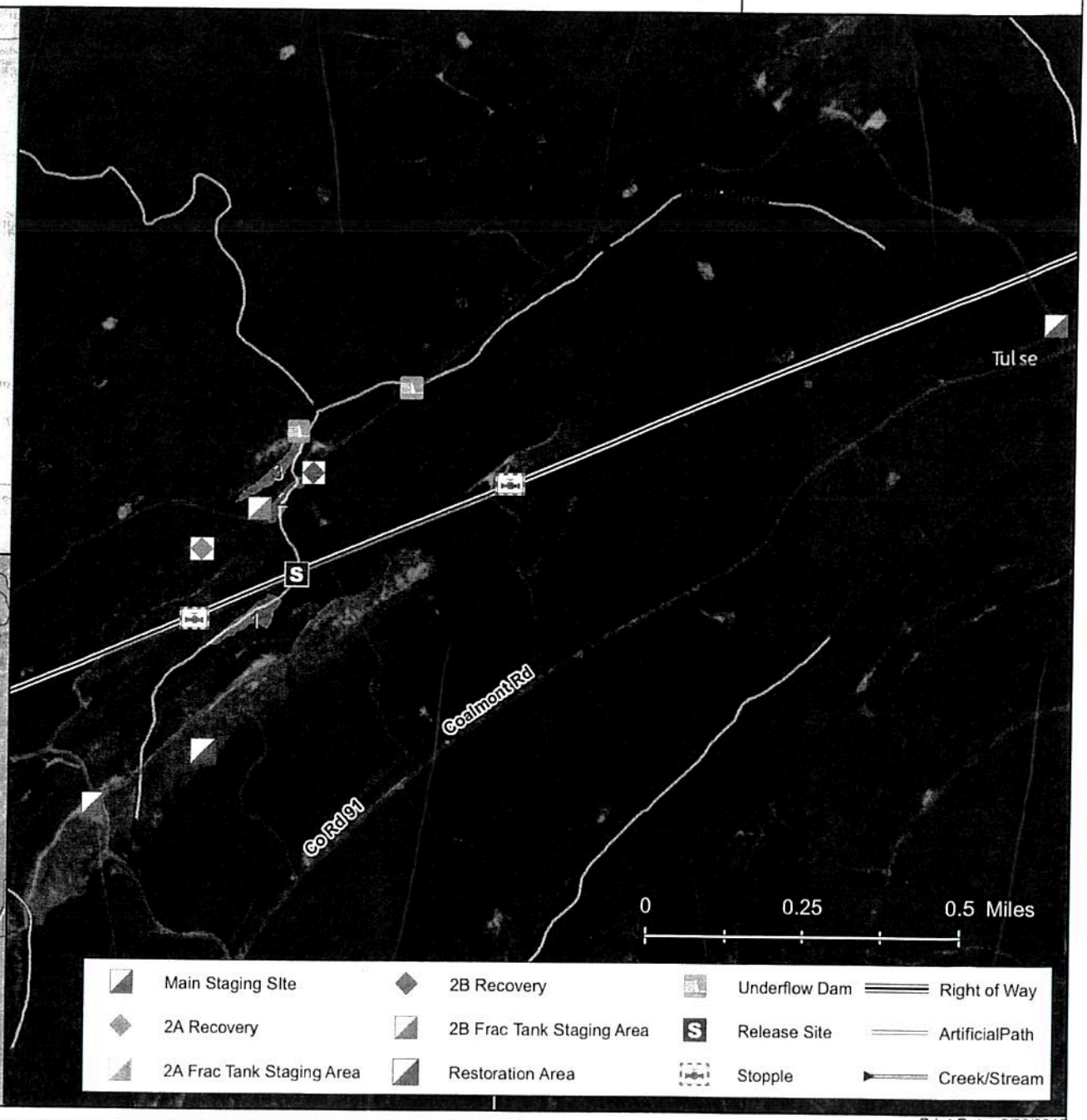
CR-91 Event

Site Location

N

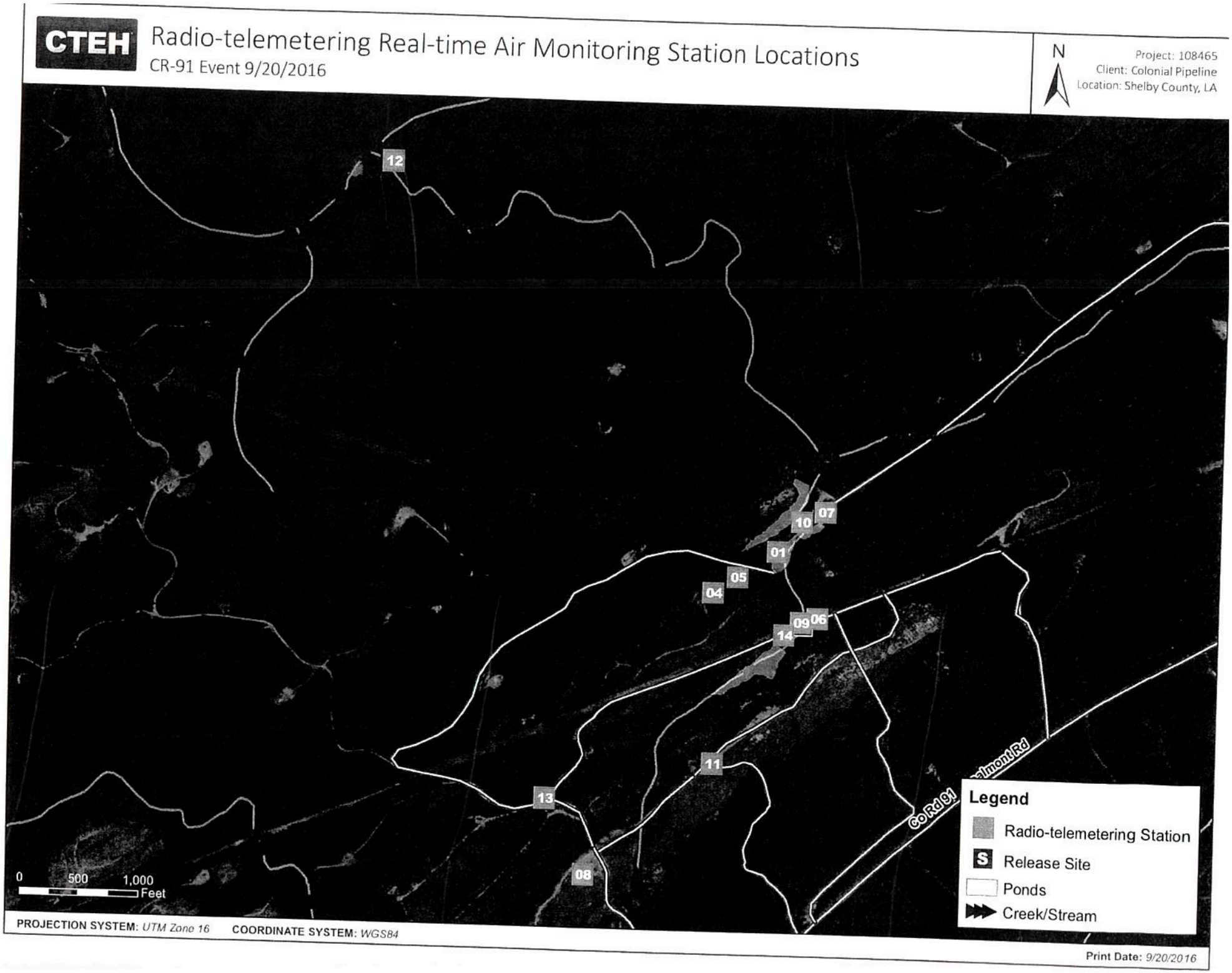
Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL





PROJECTION SYSTEM: *UTM16* COORDINATE SYSTEM: *WGS84*

Print Date: *9/20/2016*


CTEH
Radio-telemetering Real-time Air Monitoring Station Locations
CR-91 Event 9/20/2016
N
Project: 108465
Client: Colonial Pipeline
Location: Shelby County, LA
12
07
10
01
05
04
09
06
14
11
13
08
Co Rd 91
Legend
Radio-telemetering Station
S Release Site
Ponds
Creek/Stream
0
500
1,000
Feet
PROJECTION SYSTEM: UTM Zone 16
COORDINATE SYSTEM: WGS84
Print Date: 9/20/2016

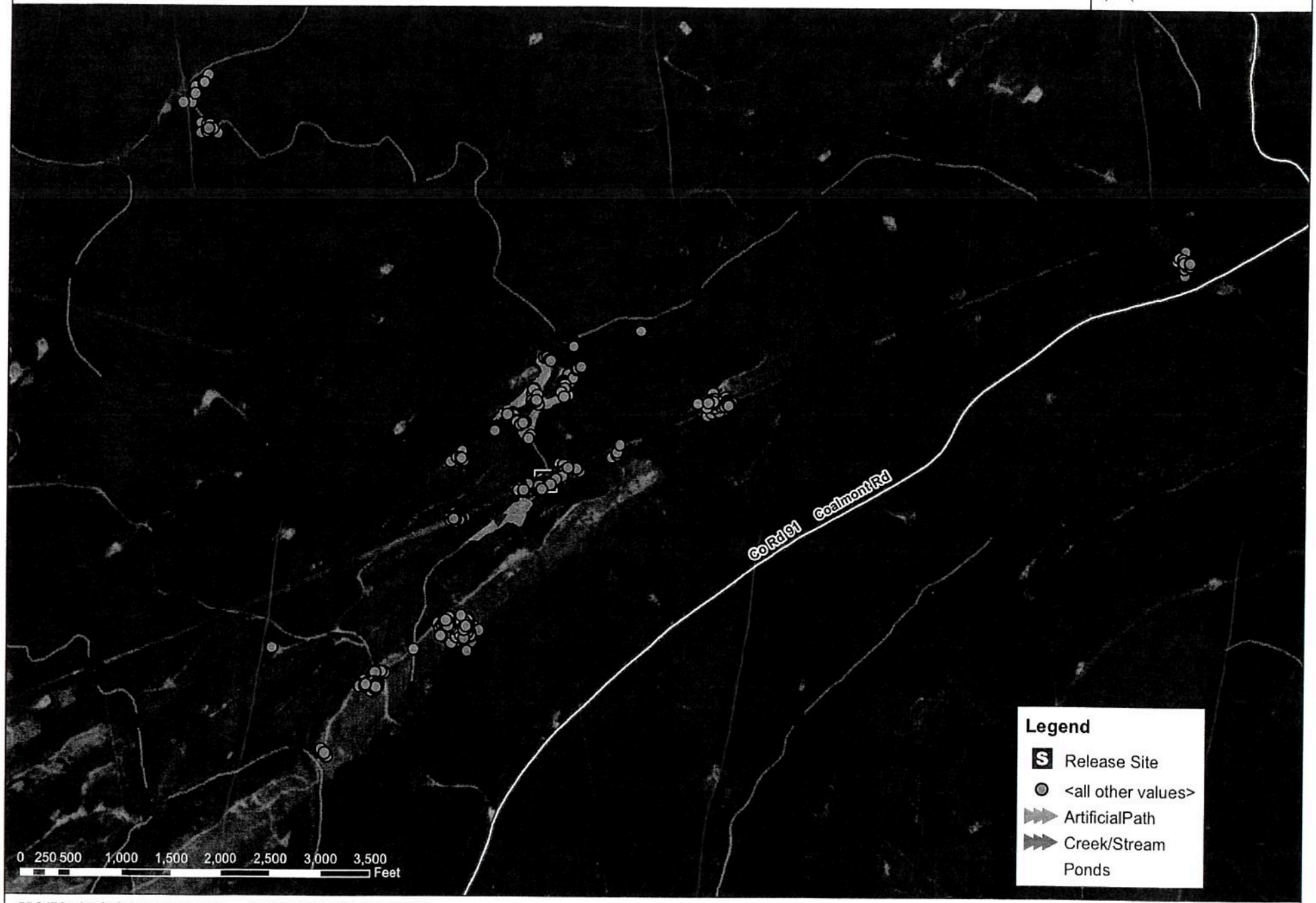
CTEH

Manually-Logged Real-Time Reading Locations

CR-91 Event | 09/19/2016 05:00 – 09/20/2016 05:00

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

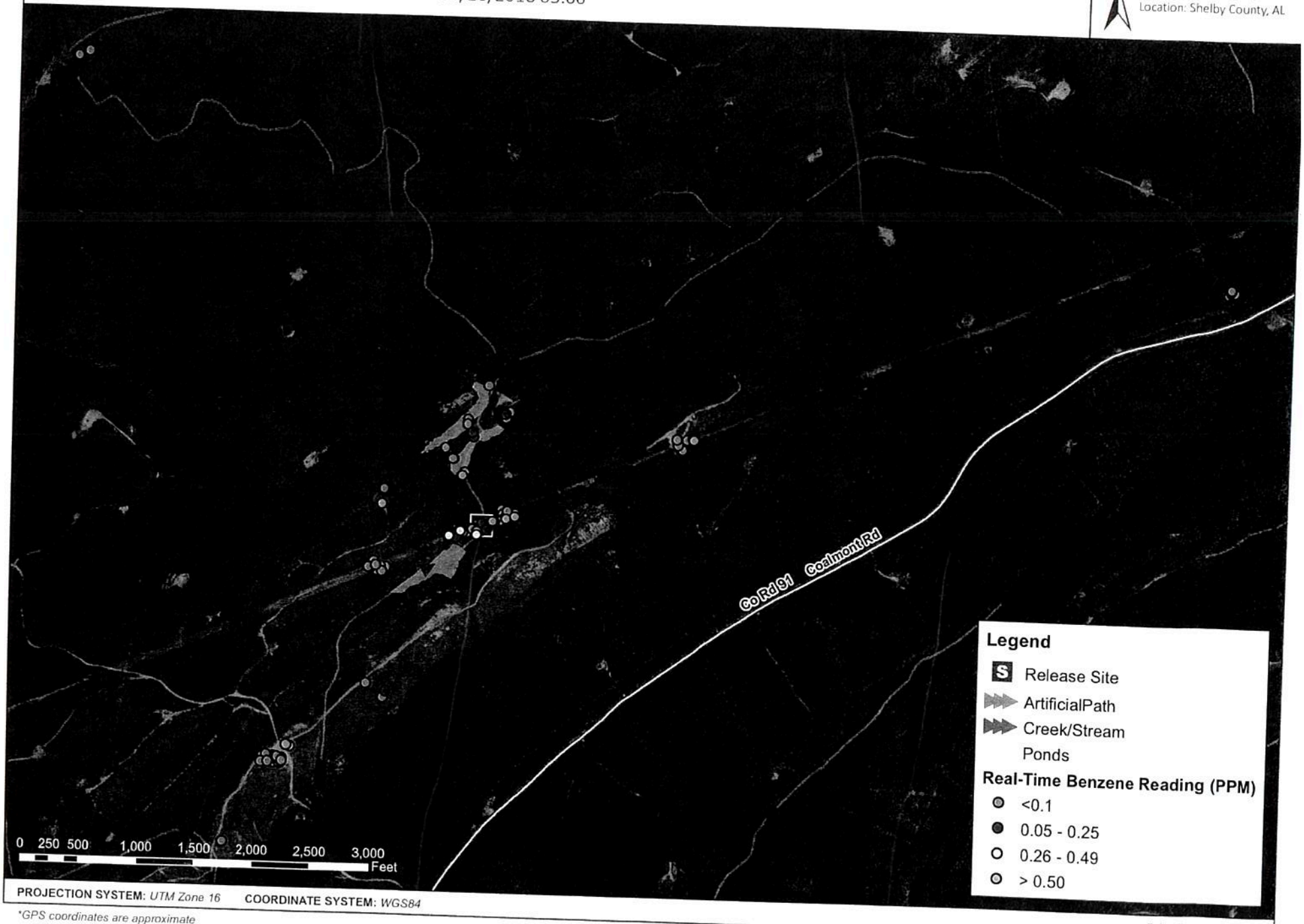
Print Date: *9/20/2016*

**GPS coordinates are approximate*

Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/19/2016 05:00 – 09/20/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

**GPS coordinates are approximate*

Print Date: *9/20/2016*

Manually-Logged Real-Time Readings | LEL

CR-91 Event | 09/19/2016 05:00 – 09/20/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL

PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

Print Date: *9/20/2016*

**GPS coordinates are approximate*

CTEH

Manually-Logged Real-Time Readings | VOC

CR-91 Event | 09/19/2016 05:00 – 09/20/2016 05:00

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL

PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

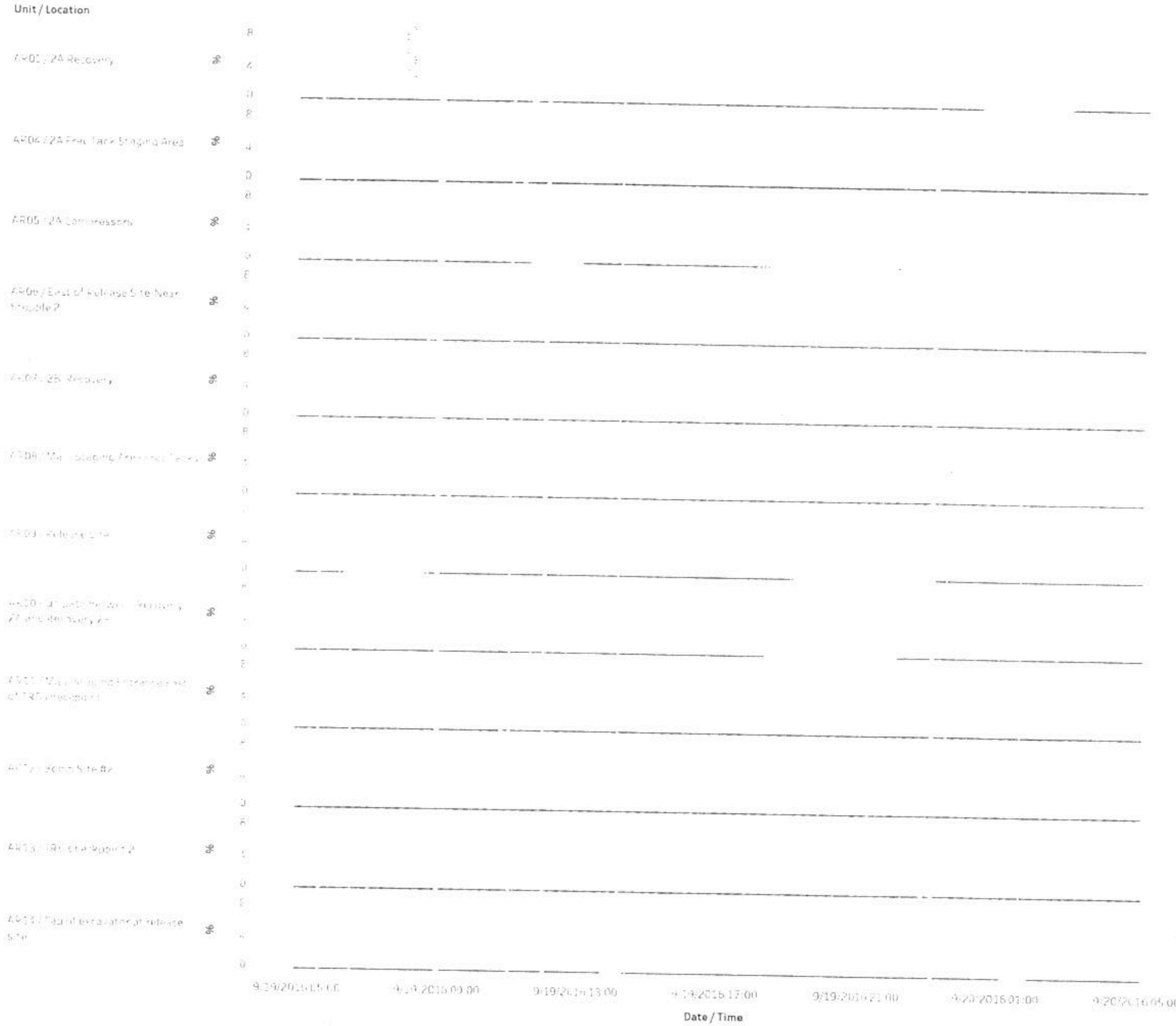
**GPS coordinates are approximate*

Print Date: *9/20/2016*

Appendix II:

Remote Telemetering Air Monitoring Graphs

Remote Telemetering Real-time Air Monitoring | LEL
CR-91 Event | 9/19/2016 05:00 to 9/20/2016 04:59

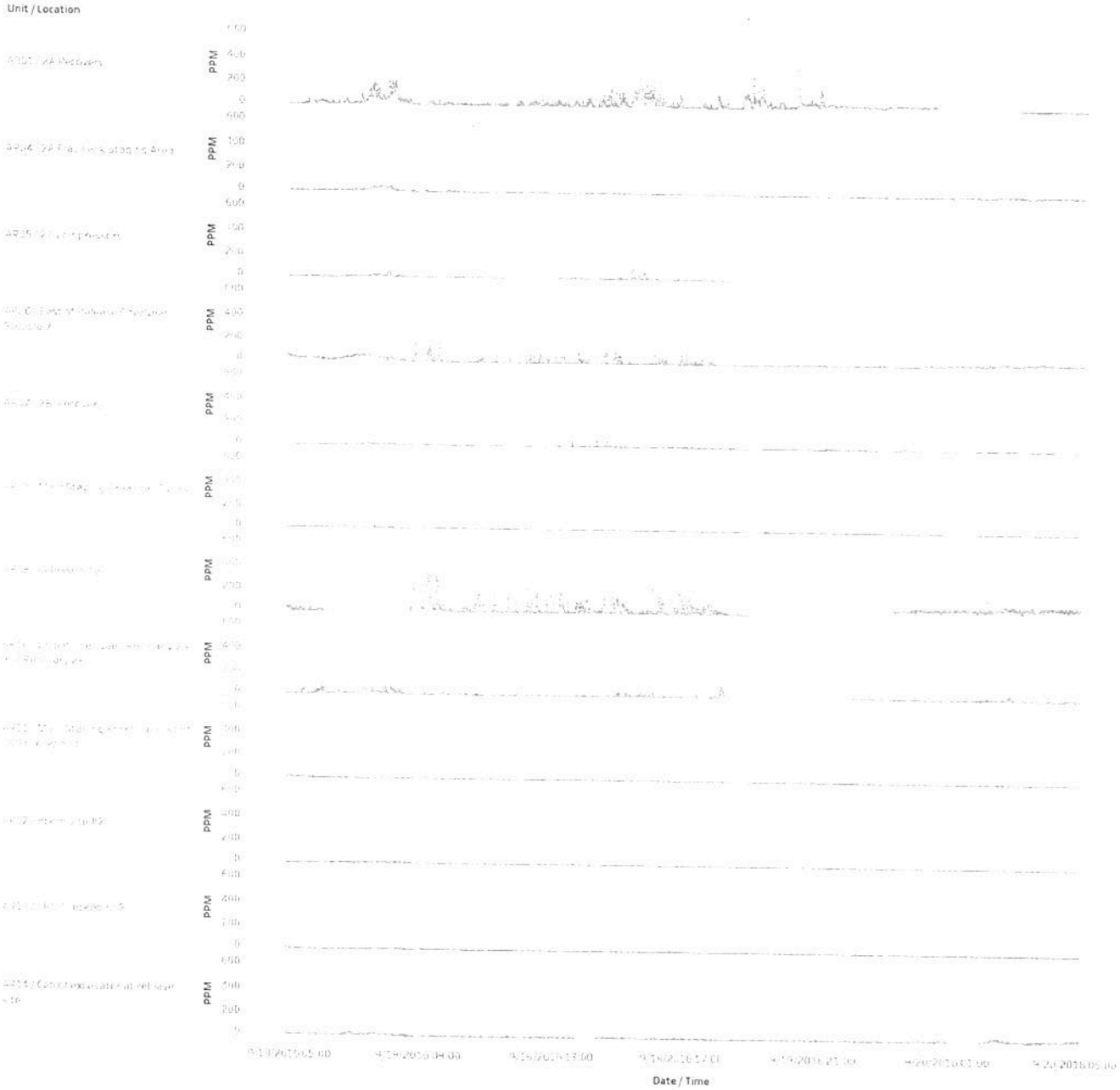


Remote Telemetering Real-time Air Monitoring | Oxygen

CR-91 Event | 9/19/2016 05:00 to 9/20/2016 04:59

Remote Telemetering Real-time Air Monitoring | VOC

CP-91 Event | 9/19/2016 05:00 to 9/20/2016 04:56



CR-91 Event – Shelby County, AL
Preliminary Air Monitoring Summary
September 22, 2016 05:00

Prepared by
Center for Toxicology and Environmental Health, L.L.C. (CTEH®)
On Behalf of Colonial Pipeline

5120 Northshore Drive ▪ North Little Rock, AR 72118 ▪ (p) 501.801.8500
www.cteh.com
Toxicology Emergency Response 24-Hour Help Desk 1.866.869.2834
Sound Scientific Solutions

Introduction

On September 9, 2016, the Center for Toxicology and Environmental Health, L.L.C. (CTEH®) initiated air monitoring in support of response efforts to the gasoline release in Shelby County, AL. This report presents the real-time air monitoring data recorded from September 21 2016 05:00 to September 22, 2016 05:00 CDT.

Real-Time Air Monitoring[1]

Real-time air monitoring was conducted to evaluate the potential airborne presence of gasoline-associated constituents, if any, during response operations. All instrumentation was calibrated at least once per day or per manufacturer's recommendations. Target analytes were measured as total volatile organic compounds (VOCs), oxygen, benzene, gasoline, hexane, naphthalene, xylene, and flammability as the percent of the lower explosive limit (LEL) using remote telemetering RAESystems® AreaRAEs, hand-held instruments such as RAESystems® MultiRAE Pro/Plus' and UltraRAEs, as well as Gastec® colorimetric detection tubes.

During this monitoring period, eight benzene, one LEL, and 12 VOC detections were recorded above the action level concentration during worker activity monitoring. During those instances when detections were sustained, workers were either wearing respiratory protection, or egressed the area in accordance with the approved sampling and analysis plan.

Table 1, below, presents the results of real-time air monitoring using hand-held instruments. Maps of the incident site location and locations of hand-held real-time air monitoring readings are provided in **Appendix I**.

[1] Real-time air monitoring refers to the use of hand-held instruments that provide near-instantaneous readings of an airborne chemical concentration without the need for laboratory analysis.

Table 1: Hand-Held Real-Time Air Monitoring Summary[1]

September 21, 2016 05:00 to September 22, 2016 05:00

Location Category	Analyte	Instrument	Count of Readings	Count of Detections	Range of Detections[2,3]
Worker Activity Monitoring	Benzene	UltraRAE	155	33	0.05 - 4.9 ppm
	Gasoline	Gastec #101L	6	2	10 - 10 ppm
	Hexane	Gastec #102L	6	1	4 ppm
	%LEL	MultiRAE Plus	90	1	8 %
		MultiRAE Pro	253	0	<1 %
	Naphthalene	Gastec #60	1	0	<0.1 ppm
	Toluene	Gastec #122	3	2	5 - 5 ppm
		Gastec #122L	4	0	<0.5 ppm
	VOC	MultiRAE Plus	78	16	0.3 - 95 ppm
		MultiRAE Pro	281	130	0.1 - 500 ppm
	Xylene	Gastec #123	6	1	3 ppm
Site Characterization	Benzene	UltraRAE	1	1	1 ppm
	%LEL	MultiRAE Pro	5	0	<1 %
	VOCs	MultiRAE Pro	7	7	25.5 - 100.6 ppm
Community	%LEL	MultiRAE Plus	1	0	<1 %
	VOCs	MultiRAE Plus	1	0	<0.1 ppm

[1]Please Note: The data displayed in the above table has not undergone complete QC analysis and is presented in a preliminary format.

[2]Maximum detections preceded by the "<" symbol are considered non-detections below the instrument limit of detection (LoD) value to the right.

[3]Numbers are the raw values, no correction factors have been applied.

In addition to worker activity monitoring, remote telemetering equipment established as an early warning system recorded no detections of VOCs above the site-specific action level of 300 ppm and 78 detections of LEL above the action level of 10% (3% as raw values on LEL sensors). **Table 2** (below) summarizes remote telemetering AreaRAE data for this monitoring period, which may contain drift events[2]. **Appendix I** and **Appendix II** include location maps and graphs for remote telemetering data, respectively.

[2] Drift is defined as any interference in the PID's or electrochemical sensor's ability to accurately report the concentration of a chemical in the atmosphere. Humidity, rapid temperature changes, and compromised batteries are examples of common sources of drift.

Table 2: Remote Telemetering Real-time Air Monitoring Summary[1,3]

September 21, 2016 05:00 to September 22, 2016 05:00

Unit	Location Description	Analyte	Count of Readings	Count of Detections	Range of Detections[2]
AR01	2A Recovery	%LEL	4350	161	3 - 4.5 %
		VOC	4350	1638	0.1 - 129.2 ppm
AR04	2A Frac Tank Staging	%LEL	5334	0	<1 %
		VOC	5334	2202	0.1 - 14.7 ppm
AR05	2A Compressors	%LEL	5396	0	<1 %
		VOC	5396	915	0.1 - 30.4 ppm
AR06	East of Release Site/Near Stopple 2	%LEL	5446	0	<1 %
		VOC	5446	2185	0.1 - 158.4 ppm
AR07	2B Recovery	%LEL	5019	0	<1 %
		VOC	5019	3218	0.1 - 28.4 ppm
AR08	Main Staging Area Frac Tanks	%LEL	5449	0	<1 %
		VOC	5449	1319	0.1 - 15.2 ppm
AR09	Release Site	%LEL	5454	2	2.5 - 2.9 %
		O_2	5454	5454	20.4 - 21.5 %
		VOC	5454	4224	0.1 - 283.6 ppm
AR10	On path between Recovery 2A and Recovery 2B.	%LEL	5257	0	<1 %
		VOC	5257	2948	0.1 - 100.8 ppm
AR11	Main Staging Entrance East of TRG checkpoint	%LEL	4278	0	<1 %
		VOC	4278	1772	0.1 - 9.5 ppm
AR12	Boom Site #2	%LEL	5559	0	<1 %
		VOC	5559	2147	0.1 - 1.9 ppm
AR13	TRG Checkpoint 2 - access to stopple 1, Recovery 2A and 2A Frac Tank Staging Area.	%LEL	5314	0	<1 %
		VOC	5314	1882	0.1 - 5.8 ppm
AR14	Cab of excavator at release site	%LEL	5287	0	<1 %
		VOC	5287	2433	0.1 - 34.4 ppm

[1]Please note: The data displayed here has not undergone complete QA/QC analysis and is presented in a preliminary format.

[2]Maximum detections preceded by the "<" symbol are considered at the limit of detection (LoD) value to the right.

[3]LEL and VOC values are raw values, correction factors have not been applied.

Appendix I:

Site Location, Hand-Held Real-Time Air Monitoring Location, and Remote Telemetering Air Monitoring Location Maps

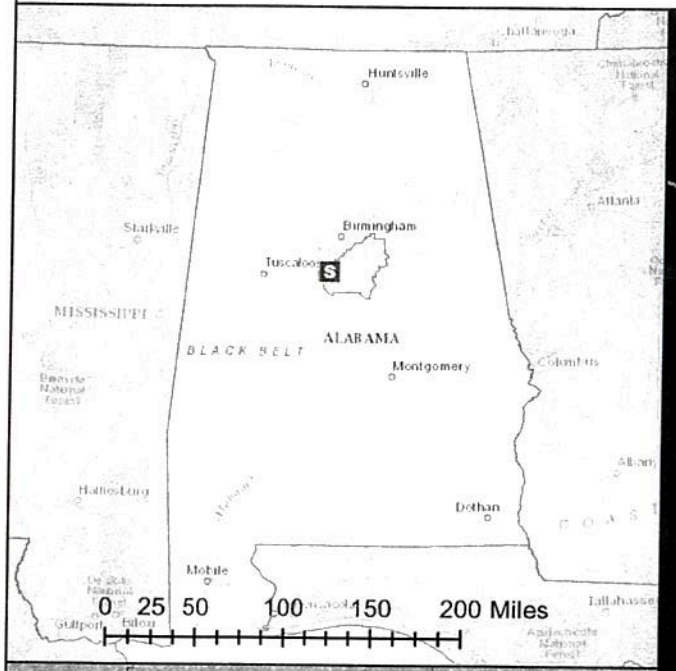
CTEH

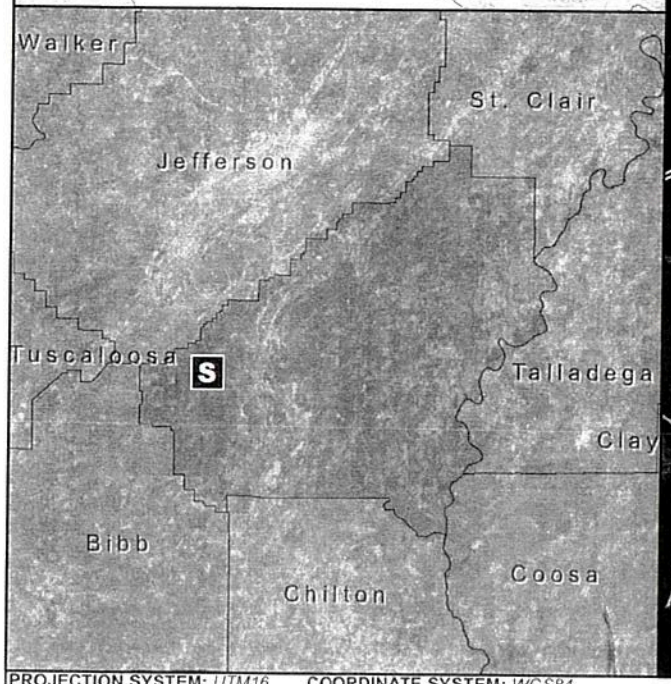
CR-91 Event

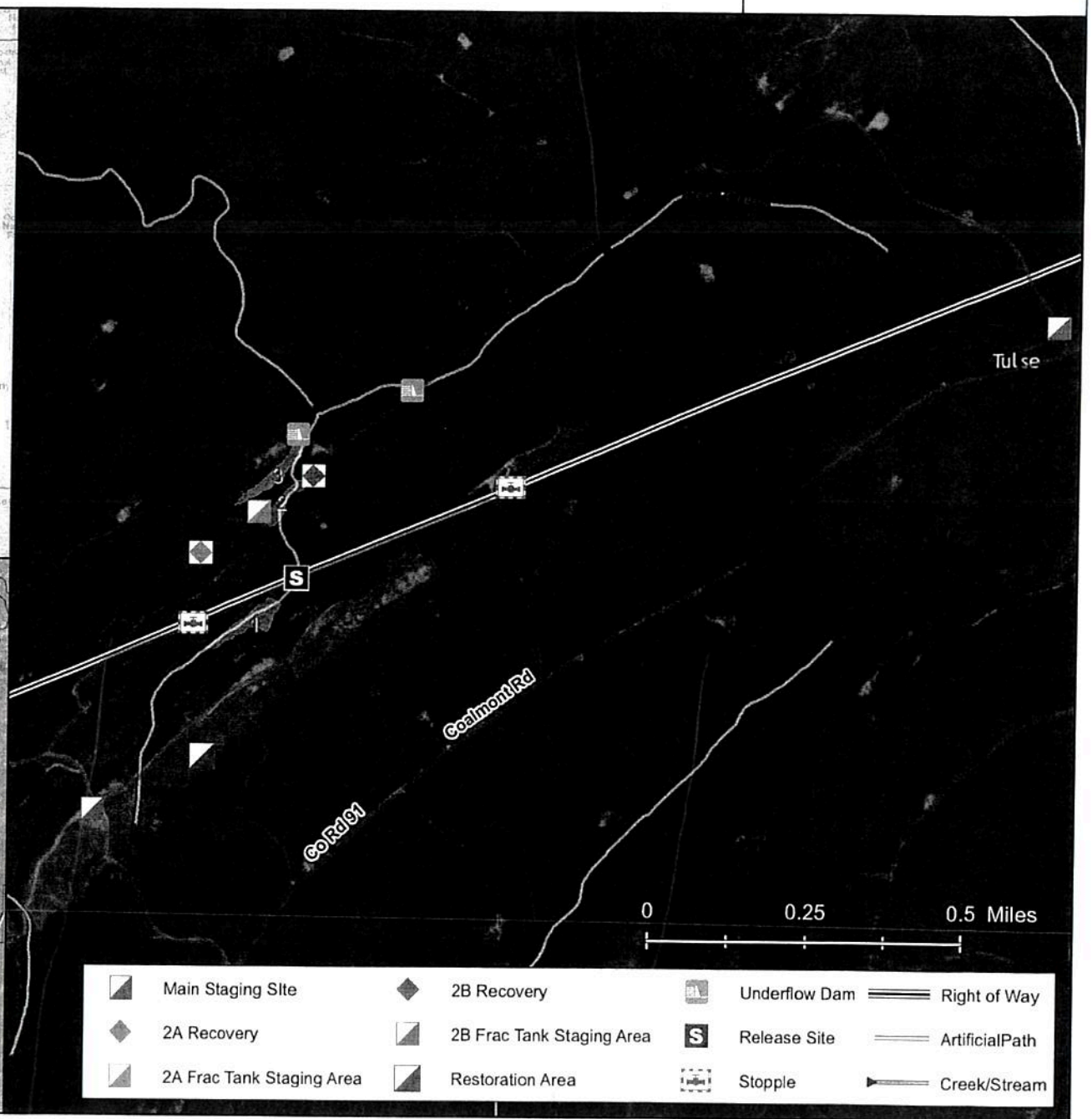
Site Location

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL







PROJECTION SYSTEM: *UTM16* COORDINATE SYSTEM: *WGS84*

Print Date: *9/20/2016*

CTEH

Radio-telemetering Real-time Air Monitoring Station Locations

CR-91 Event 9/22/2016

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, LA

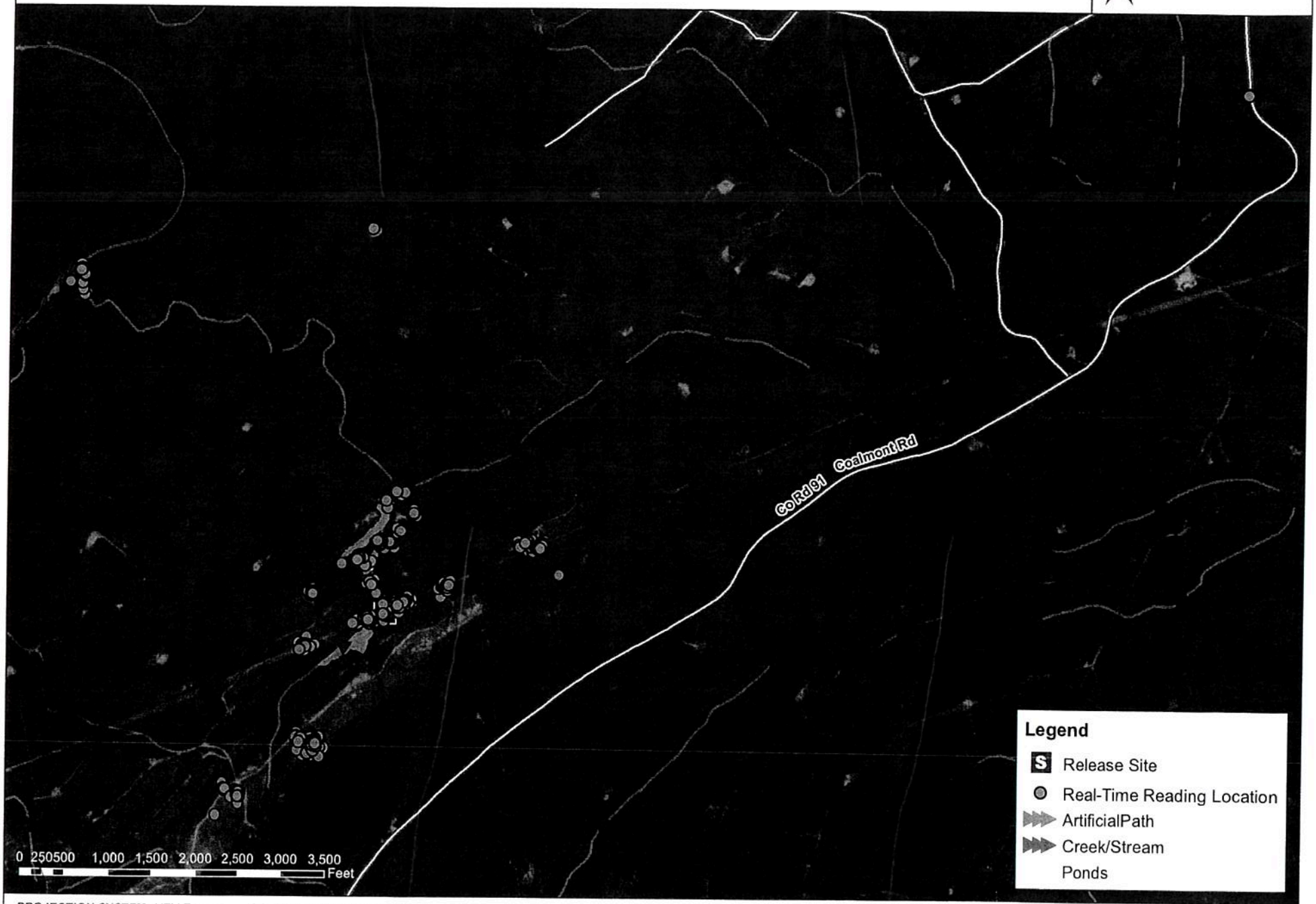
PROJECTION SYSTEM: *UTM Zone 16* COORDINATE SYSTEM: *WGS84*

Print Date: *9/22/2016*

Manually-Logged Real-Time Reading Locations

CR-91 Event | 09/21/2016 05:00 – 09/22/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

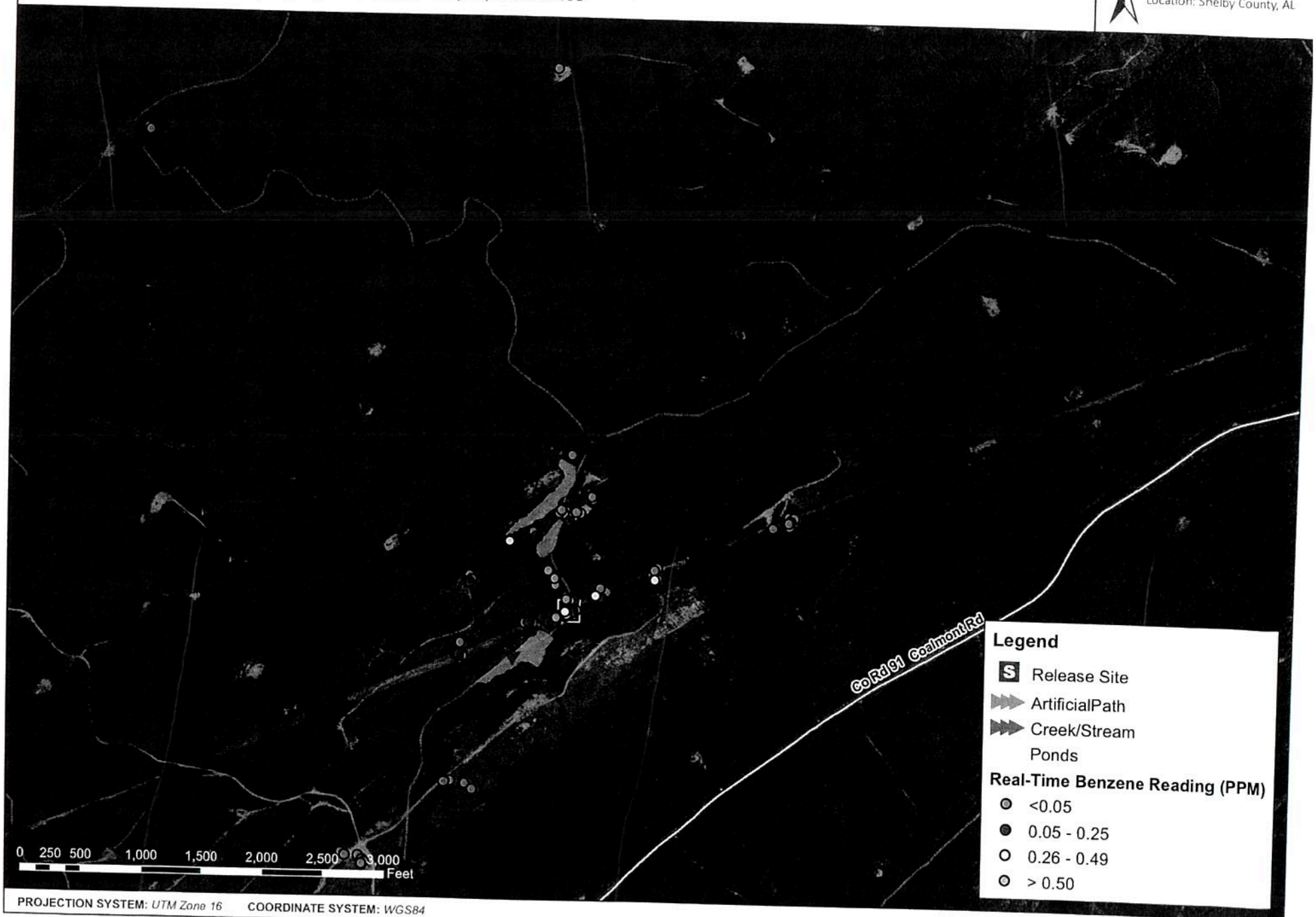
Print Date: *9/22/2016*

**GPS coordinates are approximate*

Manually-Logged Real-Time Readings | Benzene

CR-91 Event | 09/21/2016 05:00 – 09/22/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

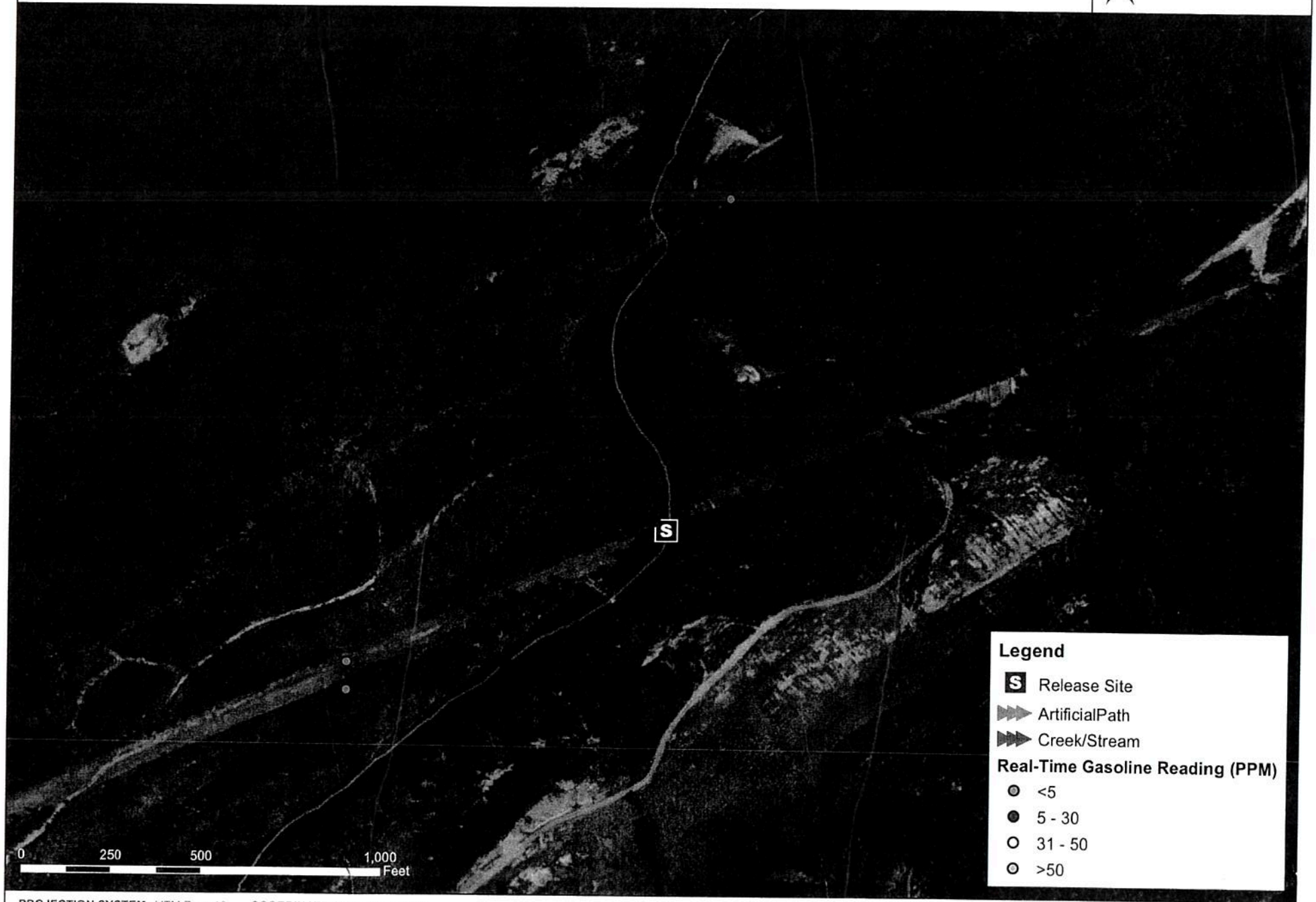
**GPS coordinates are approximate*

Print Date: *9/22/2016*

Manually-Logged Real-Time Readings | Gasoline

CR-91 Event | 09/21/2016 05:00 – 09/22/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

Print Date: *9/22/2016*

**GPS coordinates are approximate*

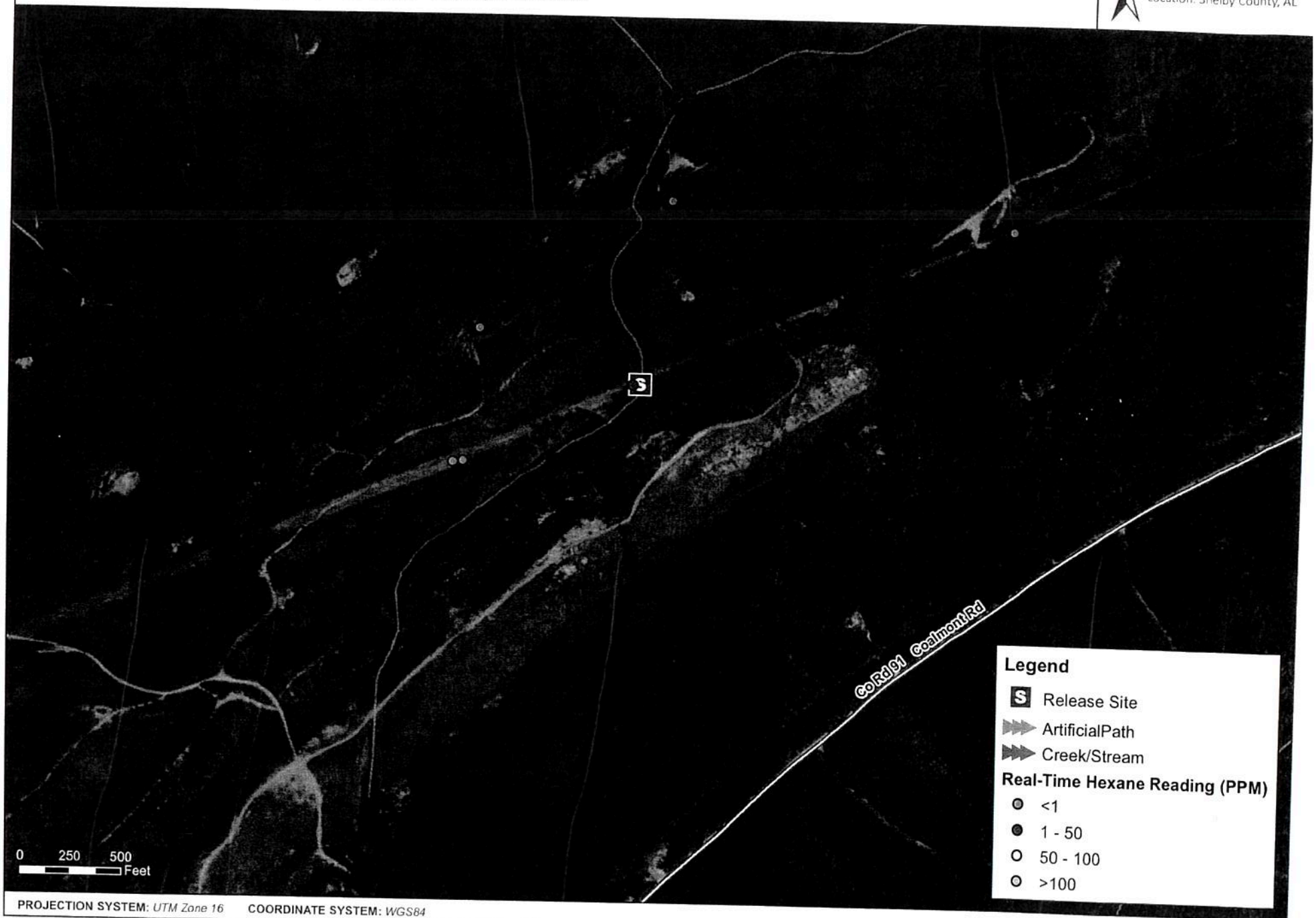
CTEH

Manually-Logged Real-Time Readings | Hexane

CR-91 Event | 09/21/2016 05:00 – 09/22/2016 05:00

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

**GPS coordinates are approximate*

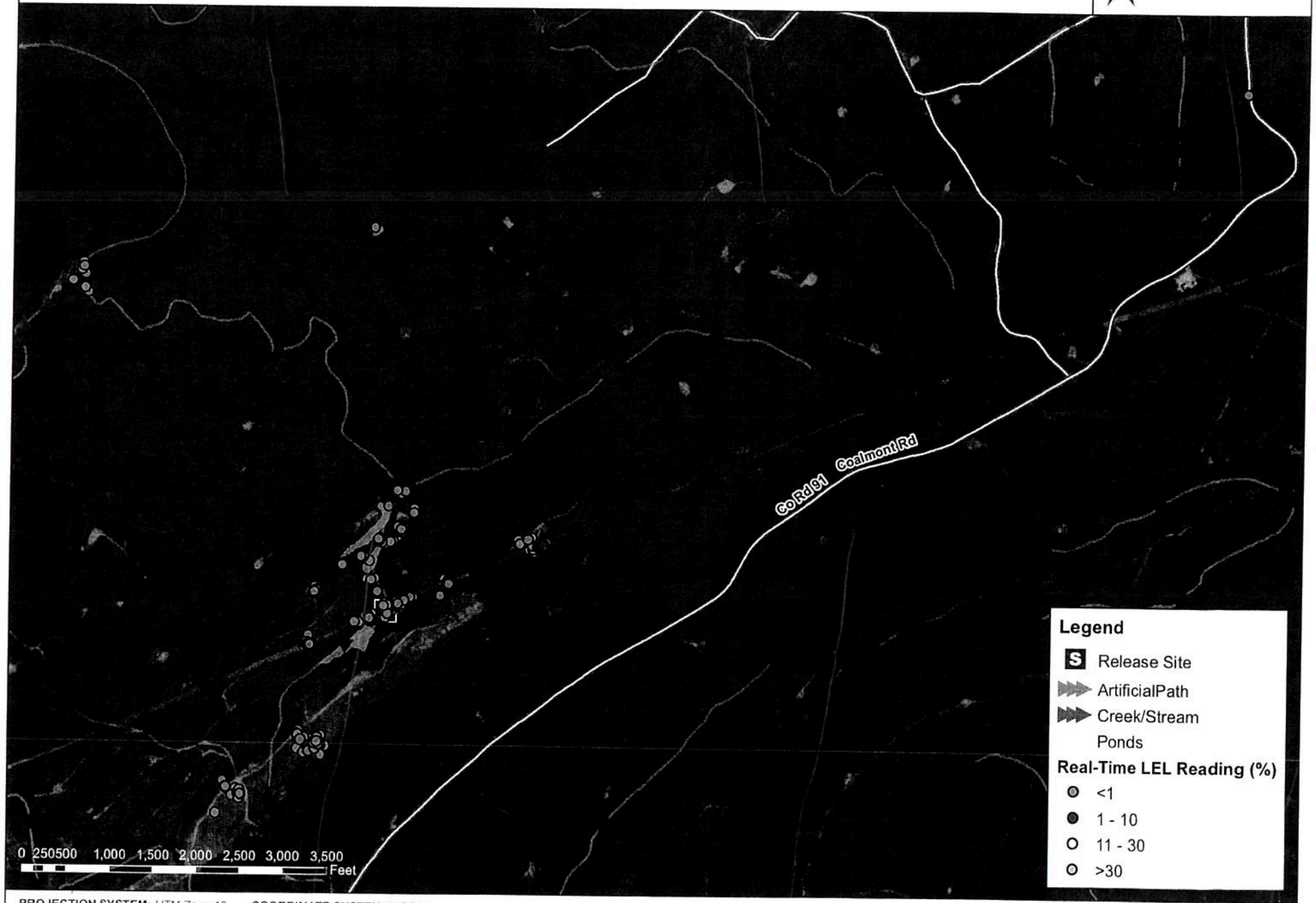
Print Date: *9/22/2016*

Manually-Logged Real-Time Readings | LEL

CR-91 Event | 09/21/2016 05:00 – 09/22/2016 05:00

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

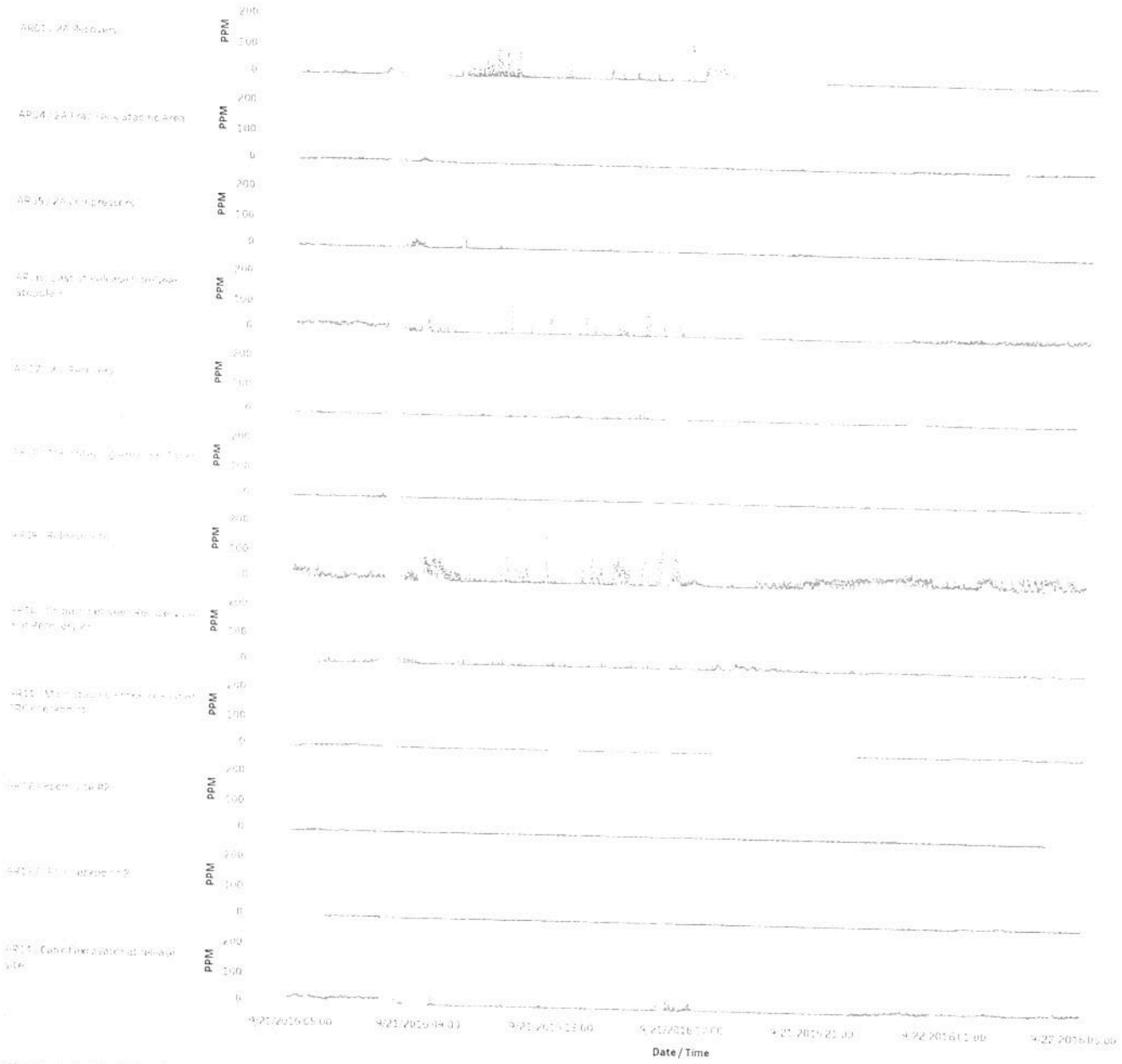
Print Date: *9/22/2016*

**GPS coordinates are approximate*

Remote Telemetering Real-time Air Monitoring | VOC

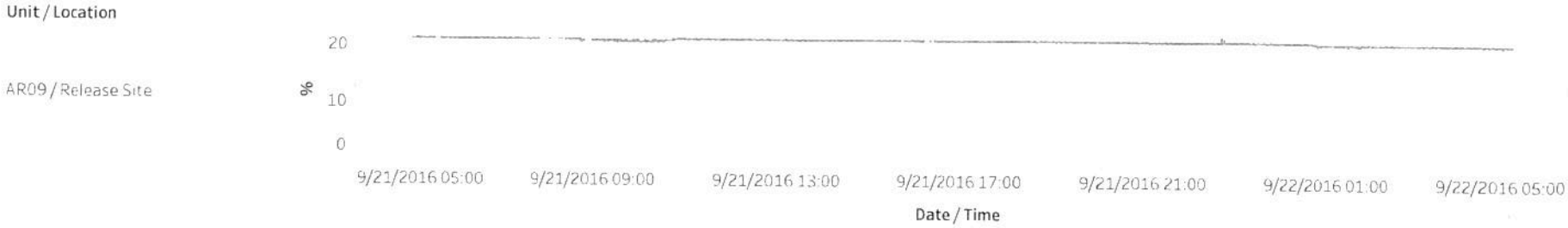
CR-91 Event | 9/21/2016 05:00 to 9/22/2016 04:59

Unit / Location



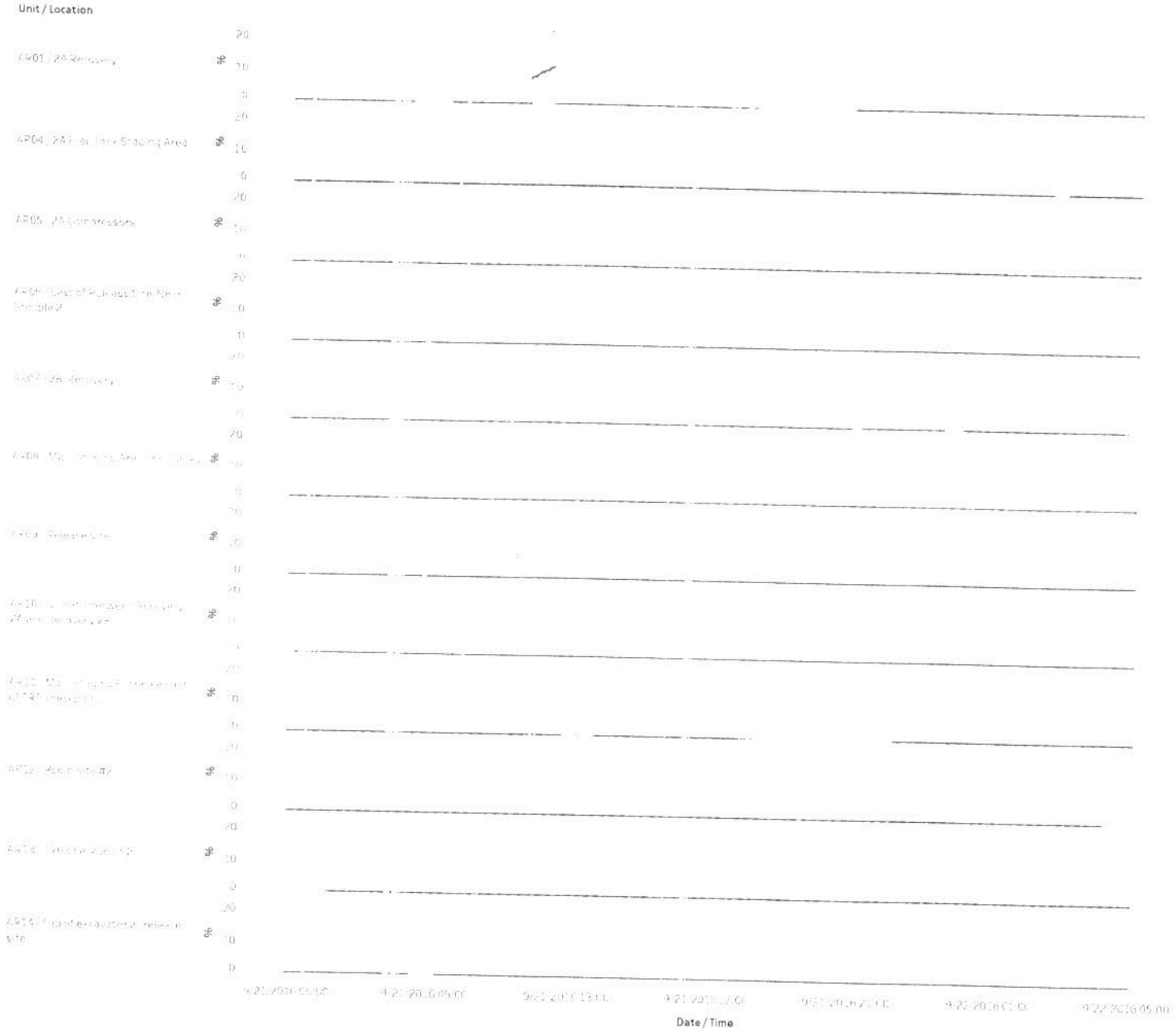
Remote Telemetering Real-time Air Monitoring | Oxygen

CR-91 Event | 9/21/2016 05:00 to 9/22/2016 04:59



Remote Telemetering Real-time Air Monitoring | LEL

CR-91 Event | 9/21/2016 05:00 to 9/22/2016 04:59



Appendix II:

Remote Telemetering Air Monitoring Graphs

Manually-Logged Real-Time Readings | VOC

CR-91 Event | 09/21/2016 05:00 – 09/22/2016 05:00

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL

PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

**GPS coordinates are approximate*

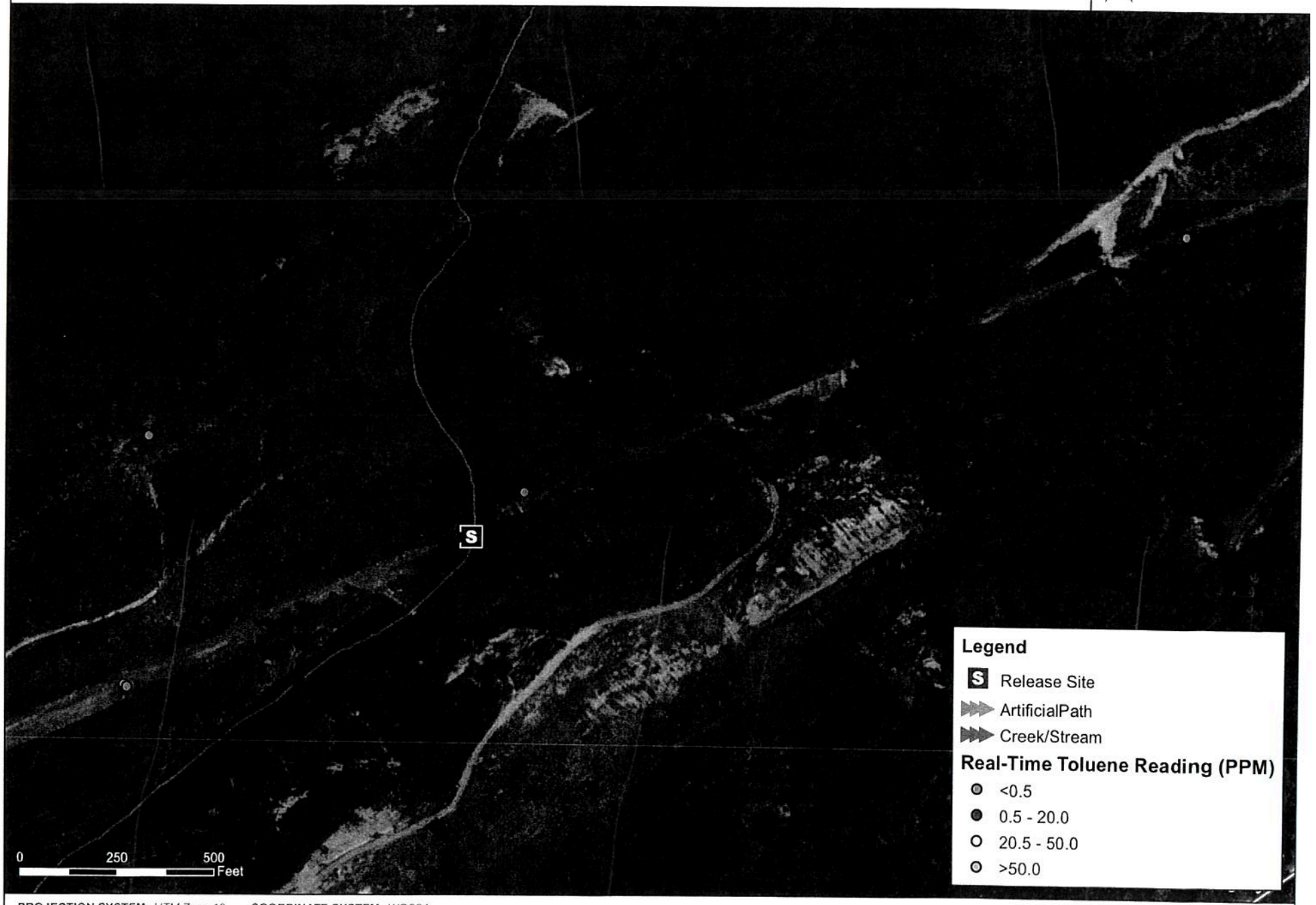
Print Date: *9/22/2016*

Manually-Logged Real-Time Readings | Toluene

CR-91 Event | 09/21/2016 05:00 – 09/22/2016 05:00

N

Project: 108465
Client: Colonial Pipeline
Location: Shelby County, AL



PROJECTION SYSTEM: *UTM Zone 16* **COORDINATE SYSTEM:** *WGS84*

Print Date: *9/22/2016*

**GPS coordinates are approximate*